Smithsonian

December 1981

Japanese macaque mother and baby in Minnesota's zoo for all seasons (p.62)

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Smithsonian

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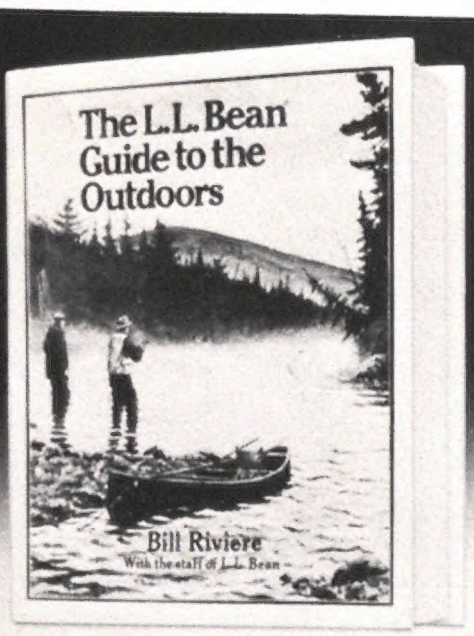

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*EPA estimated 45 mpg, 58 highway estimate. (Use "estimated mpg" for comparisons. Your mileage may vary with weather, speed and trip length. Actual highway mileage will probably be less.)

Secretary Ripley's comments

The view from the castle

Rather than being phased out, our university museums, more important today than ever, should be jealously protected, and kept going

The president of a large university wrote recently to ask my opinion on the "utility" of museums of natural history to institutions such as his. I gave him my opinion—that they are invaluable—and perhaps immodestly referred him to *The Sacred Grove*, a book of essays I wrote in 1969 on why such museums exist, as teaching tools for students and for the public.

"A museum," I wrote, "has an obligation to hold itself in readiness to prove the validity of its collections. Natural history collections serve inevitably as data banks, figures marked upon the clock face of environmental time. . . . It is like studying tree rings or interpreting pollen deposits in cores from lake bottoms. Specimens provide the source for a kind of biological iconology in which their study allows one to extract conclusions about the populations of . . . species, their occurrence, distribution and fate."

Universities and natural history museums grew together in the 19th century. Many universities had their own natural history collections in museums from which students in many disciplines—from geology to biology and anthropology—derived information and research. Across the nation, universities and their affiliations, such as that between Columbia University and the American Museum of Natural History in New York City, exercised indispensable influence.

Today the state of the planet is a major source of concern. We are entering a gigantic "countdown" with no easy way to measure the time. Monumental changes in Earth's tropic zones, and subtle changes in its marine environments, are occurring. They may produce irreversible effects on the ability of the planet to support what we consider to be a normal pattern of sustainable human life. In this atmosphere, to view a university museum as extraneous to the "cutting edge" of science is to have an extremely myopic vision. A number of universities have given up their natural history museums, and others consider changing the structures on which they were built, in the belief that collections no longer are useful and are on the fringe of science only, smacking of tradition and the past.

Such thoughts seem to me to derive from the high priesthood of science in this country, whose ascendancy came with World War II in the breakthroughs of physics, chemistry and engineering. In that atmosphere, questions of the maintenance of the environment hardly figured. Manmade manipulations were at their peak in intellectual thought, whether engineering the environment, or building larger and larger skills in nuclear contrivances, or, in biology, manipulating the interstices of cells and their components, irrespective of external factors.

What then should one advise a beleaguered president, battling with budgets and against the long knives of the academics of "hard" science who have become the Establishment? Money does count, but so do the realities of environmental change. A university museum—which lies there, ready to hand, a preeminent source of important data—should be in the forefront. It is farcical that teaching museums should be little understood and valued. Museum persons, who often succumb to self-belittlement, should raise their voices in this day when only decibels seem to count.

S. Dillon Ripley

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Letters to the Editor

DMZ wildlife

Dear Sir: My husband and I are delighted with the credit given Dr. George Archibald and his work in your October article.

We were involved intimately in the work of the Korean Council for Crane Preservation during 1976 and 1977. I was vice-chairman of the Council, with Dr. Won Pyong Oh as Chairman. We observed the birds that wintered south of the DMZ, as well as in the area around Panmunjom. We also established feeding stations in Inchon, and through the help of my husband and his firm, Honam Oil Refinery Co., Ltd., were able to supply feed to the Inchon and DMZ areas.

It is a marvelous thing to see these magnificent birds in the wild. Several times, through the good offices of a ROK marine officer, we were able to watch the white-naped cranes feeding at the confluence of the Han and Imjin rivers. All in all, it was an experience we would not trade for any other.

Ruth Edwards
Bainbridge Island, Washington

Yorktown

Dear Sir: The picture on the cover told the entire story of the bravery of the Revolutionary drummer boy. More than 200 years ago a distant relative, remembered in family lore as "the Farnsworth boy," was upset because his duties as a drummer were demeaned by Massachusetts militiamen.

Although one of a drummer boy's duties was to set the cadence during long marches, his main job was to stand beside the officers and transmit their commands during battle. As your picture shows, the battlefield was too smoky for visual signals and the exploding cannonballs and musket balls were too noisy for shouted commands to be heard. Only a steady drumbeat was audible.

Officers and drummers were more exposed to the enemy than were foot soldiers. One reason small men or boys were chosen as drummers was that they made smaller targets. Young Farnsworth was right when he said "The drummers are the bravest men on the battlefield. Militiamen have muskets in their hands, the officers have guns and swords to protect themselves, but we drummer boys must stand still with only two small sticks for our defense."

Shirley Facey Rouleau
Perry, Georgia

Dear Sir: I have a personal interest in the triumph at Yorktown. Your article filled out and made real tales of the Revolution recounted by my grandmother from 1892, when I was four years old, until I was in my teens.

Among immigrants to Germantown, Pennsylvania, around 1700 was a family named "Aulis," later Anglicized to "Ellis." Young Abraham Ellis served with General Washington throughout the Revolution, from the terrible winter at Valley Forge until the surrender at Yorktown. Among his grandchildren was my grandmother. He told her of the snow-covered huts at Valley Forge, of crossing the Delaware with Washington to surprise the Hessians in Trenton, of the winning of the war when he and his brother served under Washington and Lafayette at the surrender of Cornwallis.

Sarah Catherine Ellis Peterson relayed to her grandchildren the tales she had heard from her grandfather. So with only one storyteller between me and the veteran of many years' service in Washington's army, I learned by word of mouth what most people must read about.

Jacob Maynard Peterson
Chico, California

Dear Sir: My compliments on the illustration of the plucky British drummer boy on your October cover. However, his red coat was not such an anomaly as was suggested. It is true that British fifers and drummers wore coats the color of their regimental facings, but the Royal Warrant of 1768 states that the coats of drum-

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This year, I have asked my mother, Sylvia, and my wife, Vicki to share some of their holiday recipes with our friends.
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mers and fifers of all Royal regiments were to be red faced with blue. At Yorktown there were at least two "Royal" regiments—the Grenadiers and the Royal Welch Fusiliers. A drummer wearing a red coat could have been chosen from either one.
George Armstrong
Wilmette, Illinois

Dear Sir: Edwards Park's lively account does not do justice to Alexander Hamilton. I cite Washington's letter when Hamilton resigned from the Treasury: "In every relation, which you have borne to me, I have found that my confidence in your talents, exertions and integrity, has been well placed. I the more freely render this testimony of my approbation, because I speak from opportunities of information which cannot deceive me. . . ."
Broadus Mitchell
New York City

Ossabaw

Dear Sir: Living only 50 miles from Ossabaw, I applaud Michael Blumenthal for showing so many others that it is truly a small part of heaven right here on Earth.
Douglas C. Wells
Hinesville, Georgia

The Windsors

Dear Sir: When your October issue arrived I was, by coincidence, reading through some letters written by my great-great-grandfather to his family in the year 1839. He was a sailor on a merchant ship transporting hogsheads of tobacco from Alexandria, Virginia, to London and Liverpool. One letter comments: "I have had a 'peep' at the Queen . . . and quite a wholesome looking Lass she is too. . . ."
Edmund F. Sironi jr.
Rowland Heights, California

Dear Sir: Mr. Massie says King William IV "had sired ten children, all illegitimate; Victoria, accordingly, was heir to the crown." Actually, the king had two legitimate children by his wife Adelaide, Princess of Saxe-Meiningen: Charlotte Augusta Louisa (born and died in 1819) and Elizabeth Georgiana Adelaide (1820-1821). Had either lived she would have succeeded her father in 1837.
Hays R. Browning jr.
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Sea Island

Future fauna

Dear Sir: I prize your occasional excursions into high-level fooling, of which this article is an outstanding example.
Mrs. Millar Graff
Brooklyn

Points of origin

Dear Sir: Two customs which Michael Olmert related—ribbon pulling and the wedding cake aleatory game—survive, combined, in my hometown. Tiny charms attached to the ends of ribbons and concealed under sugar roses are arranged around the wedding cake. The bride selects certain single women to "pull" from her cake. Each one chooses a ribbon and, at a given signal, pulls her charm. The charms include a fleur-de-lis (faith), an anchor (hope), a heart (love), a horseshoe and a four-leaf clover (good luck), a button and a thimble (forever unmarried) and a ring (next to be married).
Linda Johnson
New Orleans

Mall

Dear Sir: Although most things in lovely Wales are described by both Britons and Americans as "Welsh," the Royal Fusiliers for almost 300 years have preferred the harsher-sounding "Welch." Their long history included fighting successfully against us from Bunker Hill to Yorktown, but supportively right alongside us in June 1944 on the beaches of Normandy.
Arthur G. King, M.D.
Cincinnati

Phenomena

Dear Sir: The article by Alan P. Lightman was a refreshing use of shirt-sleeve English in discussing usually dry, incomprehensible subject matter.
Jerome Schroff, M.D.
Memphis

Packagers must have it in for me

Dear Sir: Closely challenging the Universal Annoyance as Man's most diabolical contrivance are those small circular bits of paper with prices thereon which retailers affix to the flat portions of virtually every item with an unobstructed surface. I have even seen one firmly wedded to a chessboard costing more than I make in a month. The adhesive is solvent in no known chemical; the circular form precludes attack by fingernails. Removal destroys the surface of the underlying object —and the equanimity of the remover.
Roger E. Kuehl
Kansas City, Missouri

Dear Sir: Many folks don't realize the vast good that packaging has done for them. Ever try to stack a display of chicken rice soup without cans? And at least you get your Sony in one piece.
Ronald J. Milio
Roseville, Michigan

Ringling museum

Dear Sir: Robert Wernick's September article said that had Rubens lived in the 20th century, he might have designed circus wagons. I saw such a wagon, designed by the master, in front of the Museum of Fine Arts in Antwerp in 1977.
Marlane Juran
Chagrin Falls, Ohio
Rubens was commissioned to design The Triumphal Chariot of the Victory of Calloo, celebrating two 1638 Spanish Netherlands victories. For years the chariot was drawn proudly through the streets of Antwerp in the annual Ommegang *procession. A 19th-century reproduction (below, which appeared in* SMITHSONIAN, *October 1977) stood outside the museum during the great exhibition marking the 400th anniversary of Rubens' birth. It is now housed safely within.* Ed.

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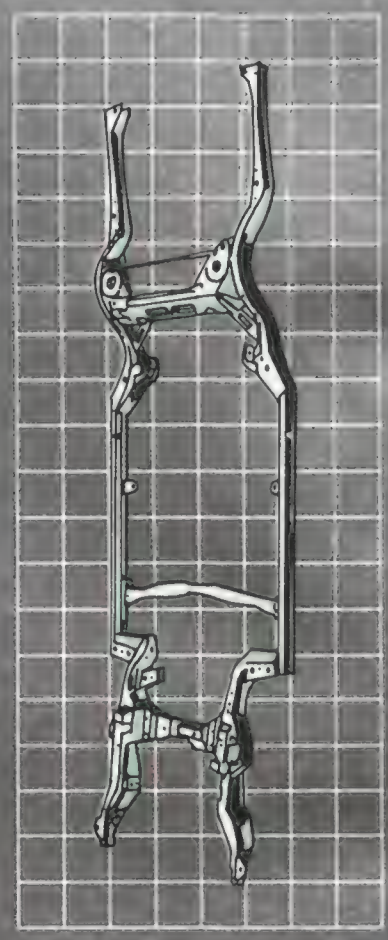

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Around the Mall and beyond

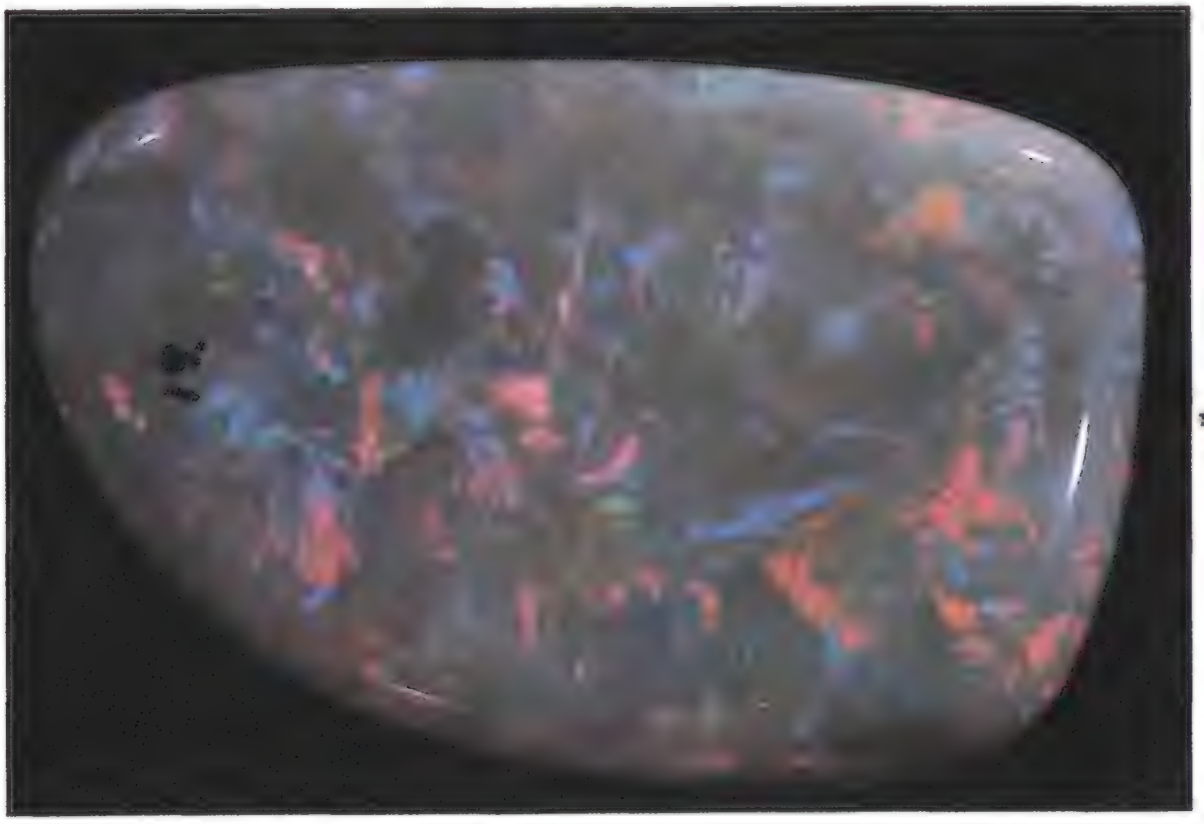
A black box can mean all sorts of things. Aerospace people use the term to describe their computer aids to flight. A bomb disposal expert is apt to react to a black box with considerable concentration, an undertaker with professional concern. And when a black box arrives under the Christmas tree of a gem fancier, he reacts with excitement, anticipation, happiness, pride—if you want to be cynical about it, you might say greed.

Well, last summer, 28 black boxes arrived at the Smithsonian Hall of Gems and Minerals, and those people over there became quite impossible to talk to. For in the boxes was the opal collection of George K. and Virginia C. Hall—almost a thousand gleaming, soapy-feeling, mysteriously beautiful stones, some of them huge, all of them adding up to an opal bonanza. This harvest, along with what the Smithsonian already has, makes the Institution's opal collection perhaps the world's best.

Having a soft spot in my heart for greed, I hurried right over to the Division of Mineralogy in the Natural History Museum, and met John Sampson White, the curator. He produced the boxes, set them on a long table and opened them, one by one, with that little flourish people have when they're showing you something very special.

It was special, all right: 945 opals nestling in their black boxes, eager to show off. Many are harlequins, the kind that contain every color of the rainbow darting and winking deep inside them. Some seemed iridescent like oil on water. Most are black opals—the basic color is dark, usually gray—and some white, as the light stones are called. One black opal is worth $14,000. That's about all I could learn about the value of the Hall Collection, but it gives you an idea.

All of the Hall opals are Australian, wrenched out of the stony soil of the South Australian semidesert country. Coober Pedy is the name of perhaps the most famous opal digging settlement and



Opal from Hall Collection weighs 150 carats, is "blue-milk, flame-red."

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that is where most of these were produced.

If you want to try your luck digging for these stones with their shimmering colors, you join a throng of rock hounds who swarm to these opal fields. Many come for the fun of prowling through the dirt in the clean outdoors—"fossicking," the Australians call it—always in hope of getting rich. It's said that about ten percent do; another 60 percent go broke; the rest make enough to keep at it.

"Opal gougers" may live in trailers and tear up the surface of the desert with dynamite and bulldozers, or, if they're really fond of the life, they may dig out an underground house and move in with the wife and kids. It can turn into a comfortable home—rugs on the dirt floor, paintings on the dirt walls, comfort and serenity in cool, clean earth instead of the parboiling heat and swarming flies of summer (thermometers can reach 130 degrees F) or the freezing nights of winter. If you expect weekend guests, just dig out another room.

As for the opals, they tend to show up in isolated lumps on the surface or in streaks underground, so your best chance is to move as much earth as possible, then wash and tumble it to sort out the likely stones. Some miners use clippers to snap off a corner of a stone and see what it's like inside. If the broken edge reveals that shining color, pulses race and temperatures seem to soar.

It's mostly luck. Anyone can do it. You pay a pittance for a miner's right, peg out your claim, 150 feet square, and go to it. See you in Coober Pedy.

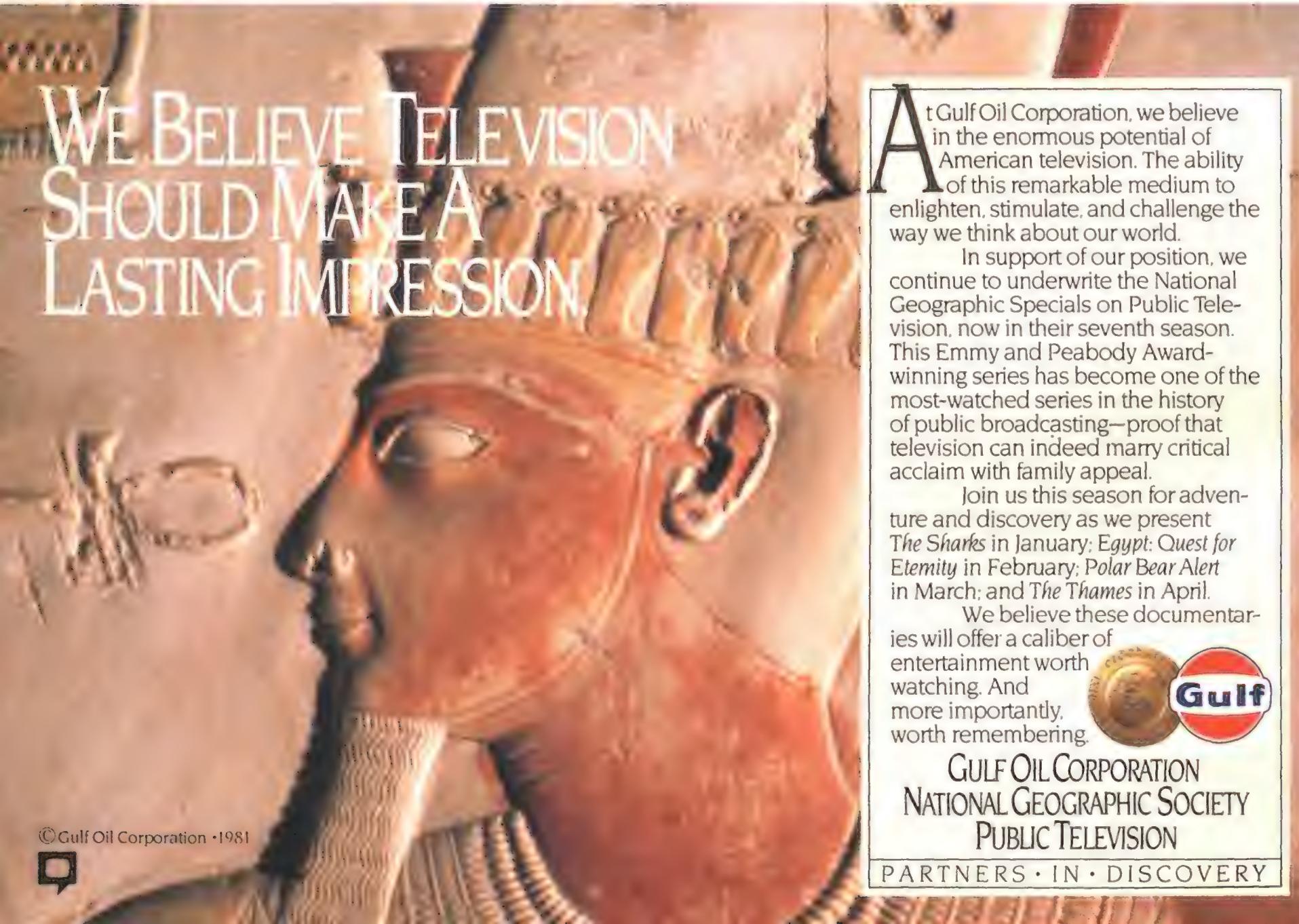
No sooner had the Smithsonian gem people digested all those Hall opals than another gemstone was donated to the Smithsonian by Colin Horowitz, president of Royal Azel Inc. This deep purple stone, 23.45 carats, writes a whole new chapter in the book of gems.

It's an interesting story. "Royal Azel," as Horowitz calls it, is the gem form of sugilite and contains manganese. In 1975, a prospector came to the Kalahari Desert in southern Africa to get some core samples. Studying them, he saw a line of color—magenta. He didn't do anything about it, but he remembered it and went back to it last year. This time the deposit was dug out—a hard, magenta form of sugilite.

As far as anyone knows, the stuff is only found in the Kalahari Desert. This one deposit is all that has been discovered. But it's still enough to make it a marketable, sought-after stone. If you want to know where to look in the Kalahari, forget it. No one would tell me.

I was late arriving at the presentation because of morning traffic problems, so I had not been cleaned up sufficiently to permit much self-assertion. Others pressed forward eagerly to ask questions and handle the stones while I was trying furtively to buff one shoe against the other pant leg. But I did glean from Mr. Horowitz that "Royal Azel" cuts well and has a color range easing from reddish purple to deep blue purple. Some cuts and thicknesses produce gems as opaque as jade. But most, as Horowitz demonstrated with a bright little pen light, are translucent and glow with wonderful richness as the light probes them.

Gemstones undergo all sorts of tests which categorize them as to hardness, transparency, specific gravity, refractive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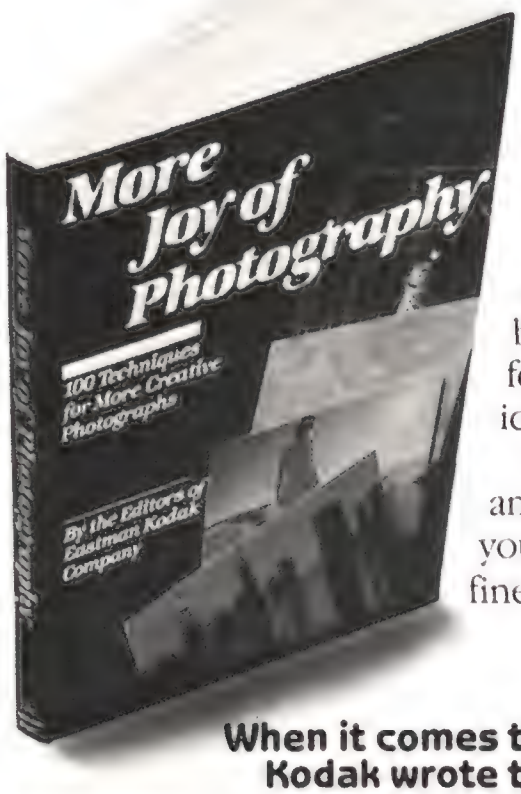

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index and a couple of other features, all designed to allow scientists a chance to play with them. "Royal Azel" comes out as a pretty choice gem, its specific gravity about like an emerald's, its refractive index varying between those of the emerald and the topaz.

Mr. Horowitz says it cuts well. To prove it he displayed a really lovely pendant, a little ribbon of platinum, curving like a swan's neck and embracing a triangular stone. The design won an award. No, the Smithsonian doesn't get that jewel.

Neither does it get the huge rock of "Royal Azel" which was displayed at the donation in order to show the gemstone in the rough. This 84,000-carat chunk is the same magenta as the pendant and the Smithsonian's gem. That weight, incidentally, comes out to be around 37 pounds.

Our gem probably won't go on exhibit

"Royal Azel" is new acquisition.

until the new hall of gems is set up. I hadn't known that a new hall of gems was in the works over at the Museum of Natural History, but indeed it is, and efforts are under way right now to raise money for it.

The new exhibition hall will include the raw minerals as well as the fine jewelry, just as the present one does. It will open, the hope is, in three years, and people will be able to see a good many of the Hall opals and the Horowitz gem.

Harry N. Abrams, the New York publishers who brought us that massive, weighty book on the National Air and Space Museum (*Around the Mall,* October 1979), have come through with another at least as much a finger-breaker and at least as beautiful. This is *The*

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National Museum of American History, written by Shirley Abbott, mouth-wateringly illustrated, mostly with photographs, by Michael Freeman and Robert Golden.

Again, it's a lavish production—rich, heavy paper, spectacular illustrations. And of course, much to my dismay, it contains items that, after all these years, I have never seen, nor even acknowledged.

Someone has said that the Smithsonian has about 76 million items, practically all of them, of course, tucked away in drawers and cases so that scholars can study them. The Museum of American History counts roughly 15 million objects in its collections. That leaves 61 million. There are alleged to be 20 million insects in the study collection at the Museum of Natural History. That leaves 41 million. . . . Well, no wonder a few things get past us.

The book pictures, for example, the gold-headed "crab tree walking stick" that Ben Franklin willed to George Washington. I had never seen it. The book talks about the original Teddy Bear, a toy inspired by a newspaper cartoon after Theodore Roosevelt spared the life of a bear cub while on one of his hunts. I didn't realize we had it. There is a wonderful piece of writing filled with stuff I didn't know about Thomas Edison.

As an old devotee of Civil War stories, however, I was personally delighted with the anecdotes about J. E. B. ("Beauty") Stuart, dashing cavalry commander of the Confederacy, the epitome of Southern knighthood. The reminiscence hinges on the Smithsonian's possession of a little six-wheeler locomotive, *Pioneer*, which General Stuart grievously wounded at Chambersburg, Pennsylvania, in 1862. *Pioneer* was healed and lives on at the Smithsonian. Jeb Stuart was killed at Yellow Tavern in 1864. But because of the locomotive he lives on in the museum too.

Immortality. That's a pretty good thing for a museum object to offer.

The book itself is a considerable museum object. It has 495 thick, rich pages, printed in Japan. Photographs, reproduced large to retain their impact, seem to glow with their own color. Most of the text is in blocks that supplement the pictures—long, detailed captions. But when Shirley Abbott introduces a section, "The Headlong Century," for example (that's the 19th), she does so with a wealth of knowledge, gracefully supplied.

Price: $50. Hefty—but so's the book.

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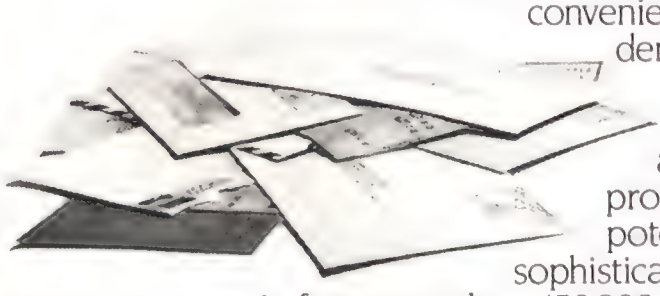

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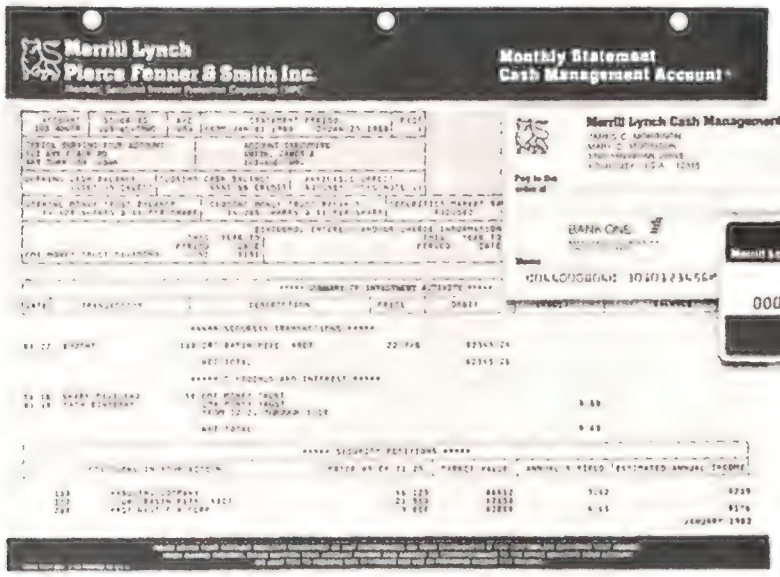

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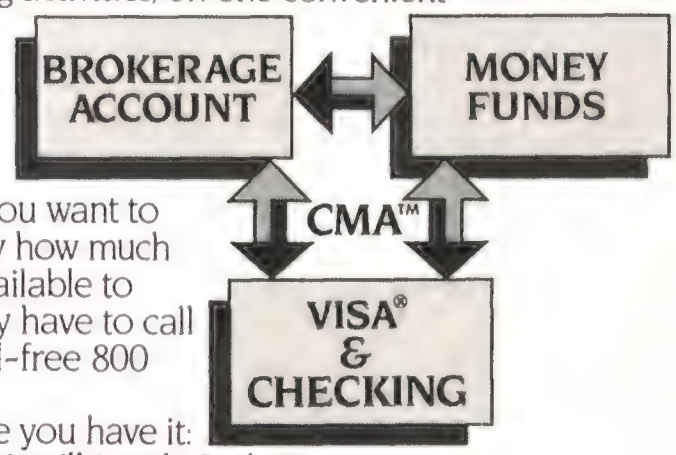

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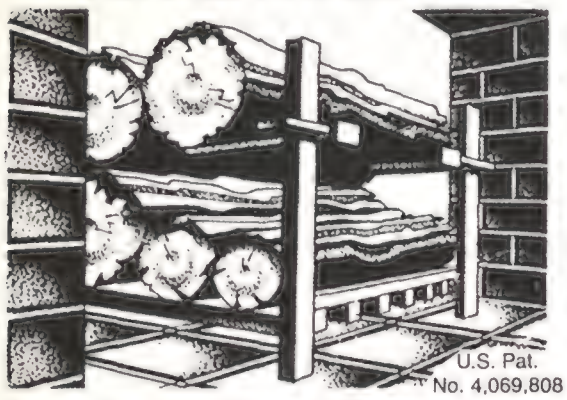

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Phenomena, comment and notes

To save chimpanzees, a scientist finds himself running a national park in Africa. A lot rides on outcome

Northern Sierra Leone, where a mosaic of savannahs, woodlands and riverine forests rises toward the Guinea plateaus, is about to have the first national park in that whole corner of West Africa. Established with the blessings of the local chiefs, the government, and a $213,000 pledge from World Wildlife Fund-U.S., the park offers multiple returns in a part of the world where the local people don't often see any return on their resources or their wildlife.

Jobs will be created where very few exist now. The chiefs had hoped for two to start; the eventual number may be closer to a hundred. Much of the road building and well drilling will occur outside park boundaries. Brick-making machines, imported to build a headquarters and research station inside the park, will be turned over to the chiefdoms.

Not only will wildlife be saved, but also the watersheds of the Great and Little Scarcies Rivers (below), whose continued health is essential for both fishing and rice farming downstream. And the park will make possible the establishment of a graduate program with specializations in wildlife biology and applied ecology at Njala University College.

Forest elephants and leopards live inside the park boundaries, as do common and possibly pygmy hippopotamuses, zebra duikers and colobus monkeys. The prizes, however, are 600 or more chimpanzees, the largest single population of the West African subspecies, *Pan troglodytes verus*, scheduled for protection. It was the export of baby chimpanzees in recent years that made Sierra Leone infamous in conservation circles, and it is the chimpanzees that may save what wildlife is left in this South Carolina-sized country.

In 1978 the U.S. Department of the Interior began to question the number of young chimps being shipped from Freetown. The exporters reportedly estimated that the chimpanzee population of Sierra

The Little Scarcies River delimits the first national park in Sierra Leone.

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Leone was at 60,000 to 80,000, a level not endangered by shipments of 200 to 300 youngsters a year, even allowing for the deaths of the mothers. But Geza Teleki, an anthropologist and primatologist at George Washington University, contended that there could not be more than 2,000 chimpanzees in the whole country, and that some of the animals had to have come from neighboring Guinea and Liberia, which prohibit their export.

Teleki spoke for the International Union for Conservation of Nature and Natural Resources (IUCN). He serves in the Primate Specialist Group of the IUCN's Survival Service Commission out of a long-standing concern. (He wrote about pressures on primate populations resulting from biomedical research in the January 1975 SMITHSONIAN.) He wangled funding for a six-month survey from the World Wildlife Fund, New York Zoological Society, Fauna Preservation Society and a Dutch newspaperman, D. A. C. van den Hoorn, who publicized the seizure of ten baby chimps at the Amsterdam airport and the repatriation of the surviving eight to The Gambia. The recently formed Sierra Leone Nature Conservation Association (SLENCA) arranged for a Land-Rover and driver from the President's office, and so in late 1979 Teleki began a trek that covered 5,600 miles by car and 800 on foot. The news was bad.

At least 95 percent of the original rain forest has been cut; the few forest preserves in the eastern part of the country are largely unprotected and are used by woodcutters, hunters and farmers. The western fourth of the country, along the coast and behind the capital, Teleki found to be an "empty quarter," with rodents and birds the largest wildlife surviving. Workers at the iron mines, paid two to three dollars a day in a country where a month's supply of rice for a family of four might cost $30, kill anything that moves for food. Market hunters from Liberia and Guinea cross the border with impunity. Teleki found trails along which smugglers moved guns, wildlife and other contraband. Sierra Leone, which still allowed the export of wildlife, was draining animals from as far as Senegal and the Ivory Coast, he found.

In the north, however, farthest from the sea, destruction had been minimal. The Susu tribesmen of Tambakha Chiefdom live lightly on the land, with population densities on the order of two to the square mile. Slash-and-burn farmers, they periodically move their villages of 30 or so inhabitants in a rotation that has been practiced for thousands of years. Animals are disappearing here, too, but at a slower rate, and many rare ones, including chimpanzees, survive. (Aside from small antelopes, the Susu do not eat game.)

None of this is news to the Freetown government, of course. Negotiations for a two-section park there, 286 square miles in Outamba and 93 in Kilimi, actually began in the middle 1960s. In 1974 the government surveyed both areas and announced its intention to establish game reserves. (One wildlife dealer responded by hiring a white hunter from Kenya along with 200 local hunters and trappers to clean out what he could before the parks could be protected effectively. The operation ended when his lodge burned to the ground about the time he was discovered to have cheated local chiefs.)

In 1978 ecologist J. R. Phillipson of Oxford University surveyed the country and recommended a national conservation strategy to protect 21 areas, including Outamba and Kilimi. That same year, in response to requests from SLENCA, President Siaka Stevens banned chimpanzee exports.

In December 1979 Teleki, Lori Baldwin of Pennsylvania State University and K. Ibrahim Bangura, the Sierra Leone superintendent of wildlife, along with some of his Wildlife Conservation Branch staff, began their six-month survey. They studied 12 of Phillipson's 21 areas, counting spent shells and traps as well as animals per mile. They talked with farmers, section chiefs, subsistence hunters, missionary trophy hunters, Liberian market hunters. They found much gone forever, and some isolated pockets of rich habitat.

Where to start? Teleki's report urged that all wildlife exports be banned, and that Outamba-Kilimi National Park (OKNP) become the nation's first conservation priority. The Ministry of Agriculture and Forestry quickly agreed.

Teleki next sought outside support. IUCN and the World Wildlife Fund approved the project. A professor of anthropology at the University of Pennsylvania and several private groups have agreed to provide technical or financial aid. The National Park Service and the Peace Corps will help as much as funding al-

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lows. Teleki went on the road with WWF-U.S. President Russell E. Train to raise funds. High school students in northern Virginia, calling themselves Citizens Helping Innocent Monkeys and Primates Survive (CHIMPS), raised $2,900 at a dance-a-thon, to be repeated this school year. American corporations donated equipment. By last October more than $120,000 had been raised.

All the while the Hungarian-born anthropologist kept in touch. Copies of every document sent to Freetown went to the Susu tribal chiefs in Tambakha, the first overseas mail they had ever received. When Virginia's CHIMPS sent in its money and T-shirts for each of the park's staff members, Teleki arranged for all the rangers, game guards and game scouts at Outamba-Kilimi to sign a thank-you letter. He went back to Freetown for a month last May, and at a June 3 meeting President Stevens agreed to a four-year ban on wildlife exports and to expedite starting up the park.

Teleki and Bangura met for six hours in Fintonia with approximately 200 Susu chiefs, headmen and elders (while wives and children waited outside), discussing plans for the area and reporting on what had happened overseas since their last meetings a year earlier. Every man with the right to farm had the right to speak, and nearly everyone did.

Without their support, Teleki believes, the park cannot survive. Thus he had won agreement that local people caught breaking the law inside the parks will be tried in local, not federal, courts. The chiefs have set up a cooperative to do business with the park, and named a special council—a "board of trustees"—that will be involved in park affairs.

A volunteer with CUSO, as a Canadian technical assistance program is called, will make a two-year botanical study of the park through Njala University College. The United Nations Food and Agriculture Organization (FAO) is advising the World Bank that a proposed multi-million-dollar forestry development project should include a certain amount for future support of OKNP.

Overseas scientific teams have funding for at least five projects: a primate survey, a chimpanzee ecology study, surveys of small mammals and birds, and a study of the competition between farmers and wildlife, a concern of local residents.

The interest generated by the Outamba-Kilimi plan is already spreading. Another chiefdom has unilaterally declared a swamp, home of two endangered crocodile and innumerable bird species, a game reserve, and a survey of manatees in a coastal area potentially suitable for park status is in the works.

Conservation in Sierra Leone, and possibly the region, will stand or fall with Outamba-Kilimi National Park, Teleki believes. The fundamental question is whether the local people believe they will be better off with the park than without it, that conservation is the most profitable way for them to go. Before it can succeed, the park must become reality.

Last May Teleki brought with him 15 uniforms for the wildlife staff, the first visible sign that the park was somehow real. Only when the park becomes tangible with a headquarters, a flagpole, ranger quarters and research stations will it be real, he says.

Thus he leaves this month for two years in Sierra Leone, not to carry out the scientific studies he was trained for but to build bridges and buildings, install what could be the first solar-power equipment in an African park, work with and train the local park staff and promote conservation education in the chiefdom.

When I saw him last he was harried but excited, laughing easily, happy to be putting away memoranda and business suits to deal instead with wildlife, research and patrol systems. His life's work had come to be focused completely on the creation of a successful park. He could hardly wait to start.

John P. Wiley jr.

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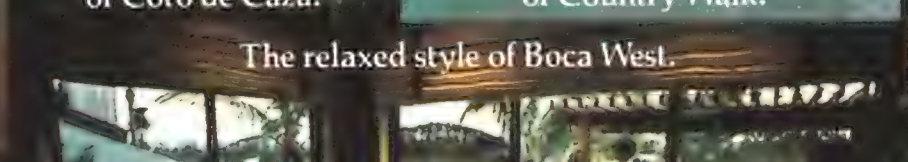

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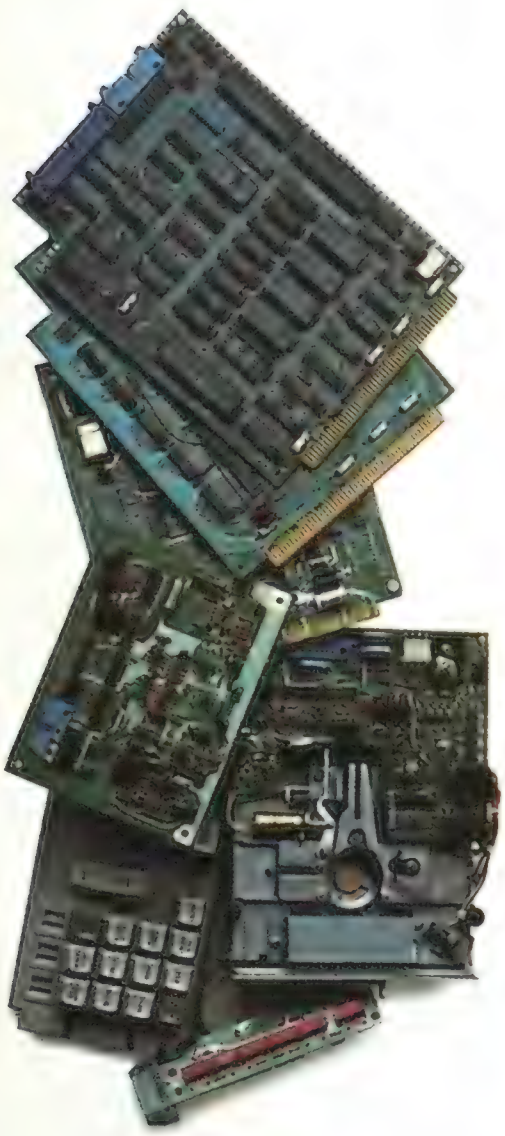

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The customs of Christmas reflect primitive sun festivals and pagan disport as well as medieval faith

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Painting of 1300s attributed to Ambrogio Lorenzetti shows St. Nicholas passing bag of gold through poor man's window for his daughter's dowry.

As The Season to be Jolly fast approaches, a Scrooge might be mindful of a 17th-century author who wrote thus of a merry-making yuletide piper: "an ill wind that begins to blow upon Christmasse Eve, and so continues, very lowd and blustring, all the twelve dayes. . . ."

These days most of us will make the best of a good thing, and join in the fun. But our parties will be sedate and civilized offerings compared with the fabled party that Charles VI of France (1380-1422) gave for his court.

Part of the revelry was for the king and his courtiers to douse themselves in tar, cover that with a layer of tow (flax fibers), and then "conga-line" through the palace, not unlike a troupe of dancing bears. Mirth reigned, at least until someone got too close to a torch. The ranks of the aristocrats were thinned that evening, as several of the play bears exited burned to a crisp. Charles the Mad (as he came to be known), always the life of the party, survived unhurt.

Unfortunately, antique Christmas celebrations were all too frequently like Charles' parties. Disport, abandon, and a deliberate undercutting of the solemnity that might be expected in conjunction with the second most important feast in Christianity: these raucous characteristics surface again and again in ancient, medieval and early modern accounts, even for festivities celebrated inside churches. How did this come about?

The answer is connected with three traditions that have fused to give us modern Christmas. The earliest is tied to the winter solstice and the agricultural importance of ensuring the sun's return for another fertile spring. This custom was added to by the Romans, who created a weeklong Saturnalia, a festival in honor of their god Saturn, the sower of seeds. The ultimate layer of meaning was applied by medieval Christianity, as its Biblically sanctioned joy over the birth of a savior occasionally got out of hand.

Most important to early Man, winter was the all-too-obvious end to the agricultural year. Primitive people throughout the Northern Hemisphere have annually noted the sun's slow but inexorable slide southward each fall. They believed something had to be done lest the sun keep going south forever, a chilling thought.

What they learned to do was to invoke the doctrine later dubbed "homeopathic magic" by anthropologist Sir James

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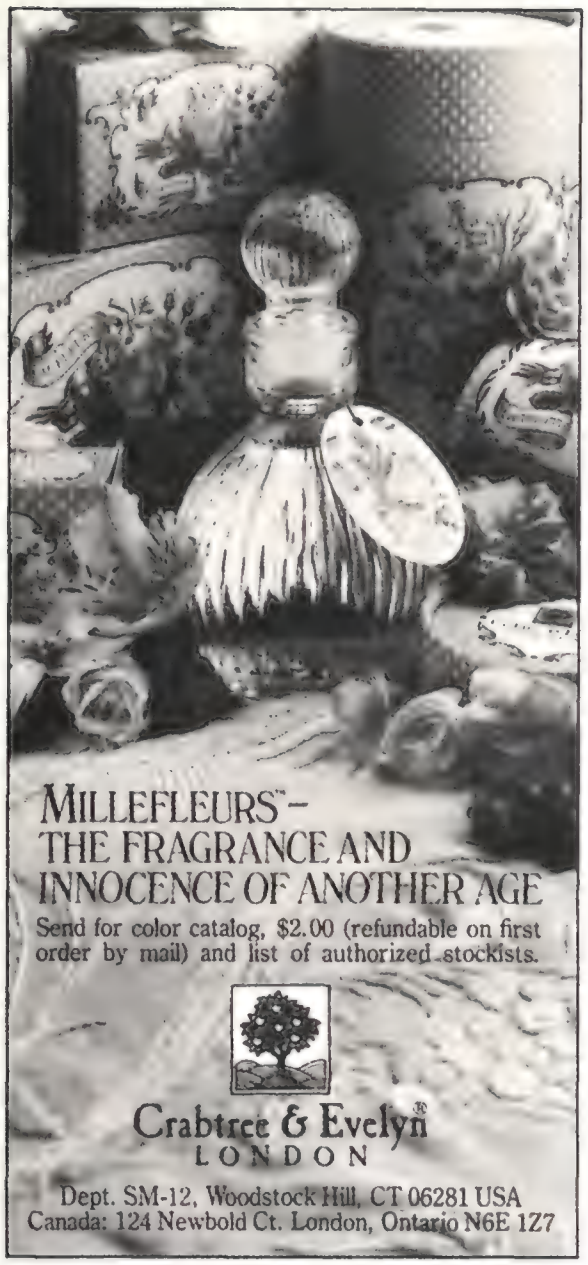

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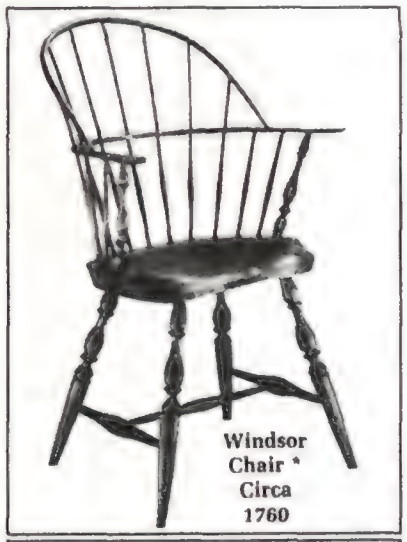
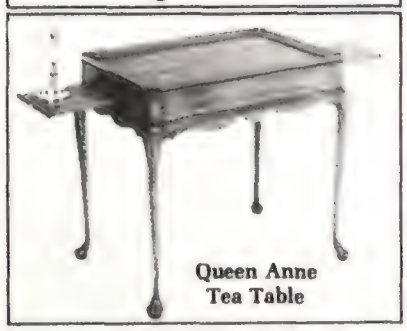
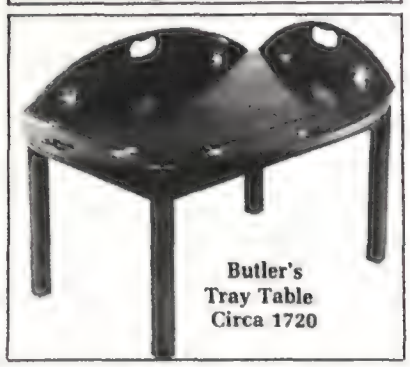


Windsor Chair * Circa 1760



Queen Anne Tea Table



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George Frazer. Essentially, this concept held that "like" attracts "like." Since the sun was obviously a great fire in the sky, it could be induced to return by building great bonfires. Sure enough, every year the sun dives lower and lower toward the horizon until December 21, where it "stands still"—literally, the *solstitium* in Latin. There, it notices all those earthly bonfires and grudgingly returns to its chastened and newly reverent devotees.

The ancients regarded the solstice as the nativity of the sun. It should come as no surprise that the solstice was observed on a slightly later date in the Roman calendar—on December 25, now regarded as a somewhat different nativity.

Of course, there is the possibility of being smug and modern about all this. By contrast, and more in the spirit of the season, one could be grateful to those ancients who kept the fires burning down through the ages. It has been said that the sun would have taken off for parts unknown if those fires hadn't turned its head. Let us hope that someone, somewhere, will be stoking the fires on this year's solstice.

In any case, the return of the light and life-giving heat is the key. For centuries, the Advent wreaths of Christian churches have been lighted with four candles, one for each of the four weeks before Christmas Day. Similarly, the traditional yule log was burned a little each day to preserve its light for the entire Christmas season. More important, a tiny bit would be carefully salvaged to spark next year's fire. The Scandinavians center their midwinter revelry around St. Lucia's Day (December 13), calling it a festival of lights. In Sweden, the Lucia Brides, with crowns of lighted candles, walk the streets at dawn delivering cookies and coffee to neighboring households.

A later tradition, growing out of the more urban sensibilities of the Romans, is the Saturnalia, the so-called "liberties of December." This celebration featured a week (December 17-23) of misrule in which the entire civil and domestic fabric of society was turned upside down. Slaves ruled masters. All wars were set aside; petty and political quarrels were forgotten. Gifts were exchanged. In general, the very Roman idea of decorum was abandoned for the week, a time derived from the extra days the Roman calendar needed each year to maintain its accuracy.

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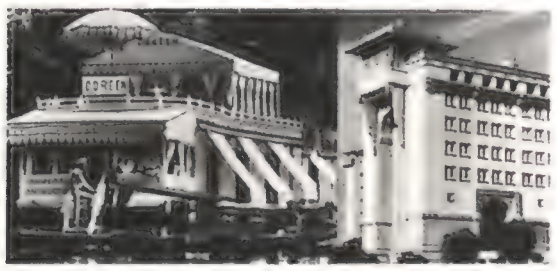

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ordinary social laws that governed mankind. It was suddenly permitted to kiss the neighbor's wife—a custom that surely survives today in the frivolity under the mistletoe and the round of kissing that culminates New Year's Eve parties.

The Middle Ages fell heir to this convoluted set of midwinter agricultural and social customs and, to their credit, medieval churchmen were surprisingly successful in translating the ancient rites to devotional purposes. The Roman "liberties of December" gave rise to the irreverent, but hardly wicked, Feast of Fools (*Festum stultorum*). Actually, a number of Christmas activities are subsumed under this title. Most involved the mock election of a child or young cleric to lead the church services in parody of elder authorities. Dancing, satirical speeches and games took place inside the church and even around the altar. The church of Beverley Minster tried to suppress the custom in 1391, but we know it was still performed at St. Paul's in London 11 years later.

The Feast of Asses (*Festum asinorum*) employed a similar liturgical parody, based on the tradition of the ass that transported the Holy Family into Egypt. The occasion was marked by an elaborate procession led by the person elected to play the ass, and continuous braying throughout the Mass by both the ass and the celebrant. In some versions, an actual ass was led about the church, to the strains of a playful anthem.

Perhaps the single most important Christian innovation in the seasonal festivals was the emphasis on families and the use of children to take part in or lead the celebrations. From among the children in each parish, each choir, each monastery, even each family, one would be selected by lot to lead the adults through the season. In England, a Boy Bishop was selected to rule over each congregation from St. Nicholas' Day (December 6) to Holy Innocents' (December 28). In Scotland, a student was elected Abbot of Unreason, until the custom was formally abolished by law in 1555.

The emphasis on childhood in all these has two obvious sources. The first is the Christ Child Himself. The second is the feast of Childermas, the commemorative Mass in honor of the Holy Innocents the Bible tells us were slain by Herod in his attempts to eradicate the infant Jesus.

The murder of the innocents was considered so horrible that the day of the week on which Childermas fell was officially regarded as a "black day" for the remainder of the year. When Holy Innocents fell on a Tuesday, no sensible person would—as a book printed in 1620 has it—put on a new suit, start any new venture or even pare his nails on that day.

In the Middle Ages, St. Nicholas was not associated with Christmas. His feast day was celebrated on December 6, with due reverence for the fourth-century bishop who was popularly credited with restoring to life three students who had been robbed and murdered by an innkeeper and pickled in a tub of brine. Nicholas the bishop was also believed to have saved three young girls from prostitution by tossing through their window bags of gold to be used as wedding dowries (p. 42).

Twelfth Night was usually the culmination of the season, and marked the end of gift giving in commemoration of the Magi's arrival in Bethlehem on the Epiphany. The litany of gifts in the song *The Twelve Days of Christmas* is a reflection of Twelfth Night.

But other special customs were also observed. One old-country tradition, translated and removed to the backwoods of North Carolina by English and Scottish settlers, was the custom of not washing during the 12 days—or there would be a death in the family during the next year.

A feast on Twelfth Night was also the occasion for selecting the family King of the Bean, a custom having roots as far back as the Roman Saturnalia. The idea was to bake a single bean into a cake, with the honorific going to the person who drew the lucky portion.

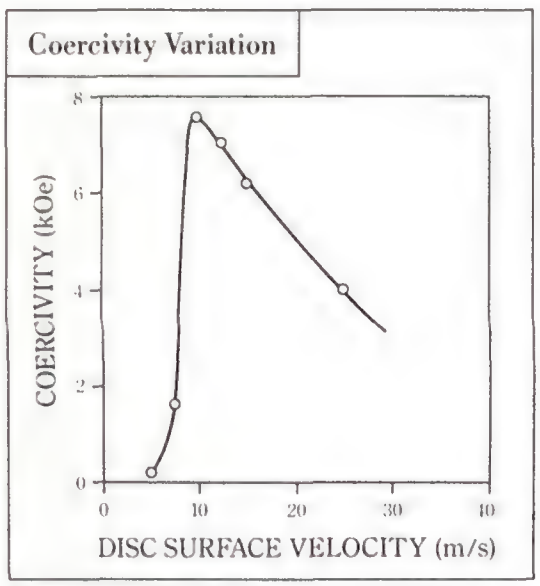
The odd thing about Christmas celebrating from today's vantage point is that it is quite hard to discern the truly reverent from the profane. Take the example of the so-called commercial shorthand, Xmas. Every year, there are well-meaning but misguided attempts to discourage this spelling on the grounds that it seems irreligious. In fact, today's "X" was yesterday's Chi, the first letter of the Savior's name in the ancient Greek gospels. And the "XP" (Chi-Rho, or the first two letters of the Holy Name) to be seen on vestments, altars, art and artifacts were nothing short of a devotional reminder to the medieval Christians, a sign widely recognized among the believers. Nothing could be more reverential.

Michael Olmert

The Critical Interval

The Critical Interval

There has long been a need in the industrial world for low-cost, high-performance permanent magnets. Recent discoveries at the General Motors Research Laboratories show promise of meeting this challenge by the application of new preparation techniques to new materials.



Coercivity of $Pr_{0.4}Fe_{0.6}$ plotted as a function of disc surface velocity.

Color-enhanced transmission electron micrograph of melt-spun $Nd_{0.4}Fe_{0.6}$ having 7.5 kOe coercivity.

TWO properties characterize desirable permanent magnets: large coercivity (magnetic hardness or resistance to demagnetization) and high remanence (magnetic strength). Higher-performance magnets are required to reduce further the size and weight of a wide variety of electrical devices, including d.c. motors. Such magnets are available, but the cost of the materials necessary to produce them severely limits their use. The research challenge is to select, synthesize, and magnetically harden economically attractive materials of comparable quality.

Prominent among alternative materials candidates are alloys composed of iron and the abundant light rare earths (lanthanum, cerium, praseodymium, neodymium). Investigations conducted by Drs. John Croat and Jan Herbst at the General Motors Research Laboratories have led to the discovery of a method for magnetically hardening these alloys. By means of a rapid-quench technique, the researchers have achieved coercivities in Pr-Fe and Nd-Fe that are the largest ever reported for any rare earth-iron material.

Drs. Croat and Herbst selected praseodymium-iron and neodymium-iron based upon fundamental considerations which indicate that these alloys would exhibit properties conducive to permanent magnet development. These properties include ferromagnetic alignment of the rare earth and iron magnetic moments, which would foster high remanence, and significant magnetic anisotropy, a crucial prerequisite for large coercivity.

That these materials do not form suitable crystalline compounds, an essential requirement for magnetic hardening by traditional methods, presents a major obstacle. Drs. Croat and Herbst hypothesized that a metastable phase having the necessary properties could be formed by cooling a molten alloy at a sufficiently

rapid rate. They tested this idea by means of the melt-spinning technique, in which a molten alloy is directed onto a cold, rotating disc. The cooling rate, which can be varied by changing the surface velocity of the disc, can easily approach 100,000°C per second. The alloy emerges in the form of a ribbon.

THE researchers found that variations of the cooling rate can dramatically affect the magnetic properties of the solidified alloys. In particular, appreciable coercivity is achieved within a narrow interval of quench rate.

Equally remarkable, synthesis and magnetic hardening, two steps in conventional processing, can be achieved simultaneously.

"X-ray analysis and electron microscopy of the high coercivity alloys reveal an unexpected mixed microstructure," states Dr. Croat. "We observe elongated amorphous regions interspersed with a crystalline rare earth-iron compound."

Understanding the relationship between the coercivity and the microstructure is essential. The two scientists are now studying the extent to which the coercivity is controlled by the shape and composition of the amorphous and crystalline structures.

"The development of significant coercivity is an important and encouraging step," says Dr. Herbst, "but practical application of these materials requires improvement of the remanence. Greater knowledge of the physics governing both properties is the key to meeting the commercial need for permanent magnets."

THE MEN BEHIND THE WORK

Drs. Croat and Herbst are Staff Research Scientists in the Physics Department at the General Motors Research Laboratories.

Dr. Croat (right) received his Ph.D. in metallurgy from Iowa State University. His research interests include the magnetic, magneto-elastic and catalytic properties of pure rare earth metals and their alloys and compounds.

Dr. Herbst (left) received his Ph.D. in physics from Cornell University. In addition to the magnetism of rare earth materials, his research interests include the theory of photo-emission and the physics of fluctuating valence compounds.

Dr. Croat joined General Motors in 1972; Dr. Herbst, in 1977.

GM General Motors
The future of transportation is here

NORFOLK REBEL

By Wesley Marx

Seafarers rethink traditional ways of harnessing the wind for commerce

From tuna fishermen to tugboat captains and oil-rig operators, the soaring cost of fuel generates new interest in working sail

A young lady approaching her teens appraised the new vessel tied to a dock in San Diego harbor. "That's a pirate ship," she announced solemnly. With two raked masts and a sleek clipper bow, the *Woniya* is liable to generate such impressions in anyone accustomed to seeing sailing ships only in costume dramas on not-so-prime-time TV. But the skipper of the *Woniya* is not a latter-day, swashbuckling Errol Flynn. Jeff Smith, a former hang-glider buff, intends to make a living by pursuing tuna halfway across the Pacific Ocean. The *Woniya* (a Sioux word for spirit, life and breath) typifies a growing number of endeavors in the United States and abroad intended to make billowing sails relevant to commerce once again.

Some sail proponents are constructing replicas of wood cargo carriers. Others build steel tankers that sprout computer-controlled sails on rotating masts. Investors in this sailing renaissance range from American tugboat operators to Japanese shipping magnates. Technical advances since the decline of the majestic windjammers add more impetus. Some clippers required 100-man crews to handle their many sails; automated gear now helps to mechanize sail handling and cut crew size. Synthetic sails are more durable than those of cotton. Fouling—growth of marine organisms on the hull—slowed the clippers; new antifouling paints can counter this. Another important break with the past: most new commercial sail vessels are now

Engineless, 1900s *Lawson* was unwieldy; today its huge sail area might interest marine innovators.

Norfolk Rebel, a sail-assisted "Tugantine" ®, can theoretically achieve 40 percent fuel saving.

His knees gripping the mast, Jeff Smith works on standing rigging of steel fishing schooner, *Woniya*.

Fuel-efficient *Cornucopia*, built for mid-Pacific albacore fishery, sails past San Francisco.

equipped with powerful engines. They can sail, rely on power alone or combine sail and power.

The spiraling cost of fuel is inspiring this sail revival. If cheap fuel helped clip the wings of sail, expensive fuel is regarded as reason enough to revive it.

Significantly, one modern American sail pioneer began his project before the energy crunch materialized. In the late 1960s, R. W. (Dave) Davies, a Pacific Coast commercial fisherman, feared that coastal stocks would succumb to heavy fishing pressures and pollution. Rather than invest in a faster power boat and more expensive gear to compete for those shrinking stocks, Davies decided to start fishing in remote areas. He knew that the albacore, a tuna species with a prodigious range, migrates from Japan to the American coast and back again. One of the areas where these transoceanic commuters come close to the surface to feed on schools of forage fish is in the mid-Pacific halfway between Midway Island and the tip of the Aleutian chain. This Grand Central Station of albacore runs was remote enough for Davies; white meat albacore fetch a premium price in the United States.

With the formidable fuel bills and engine wear that a 5,000-mile round trip mid-Pacific run entailed, he thought he could make his operation more economical with sail. He didn't need a large vessel and heavy gear; he could troll from the stern of a modest-sized boat. Suitable vessels were available from recreational sailing dealers, but during his early fishing days, Davies had shipped aboard an old New England-style fishing schooner like those once revered throughout the world. They represented more than a century of practical design experience honed on sharp competition; the first schooner fisherman to return from the Grand Banks received top dollar for his catch. "I didn't want to pass up this experience," recalls Davies. "After all, the water is still the same."

With rare exceptions, commercial yards no longer

Wesley Marx specializes in marine subjects. His latest book, The Oceans: Our Last Resource, *has just been published by Sierra Club Books.*

Ship builder Morgan Davies welds steel hull of fishing schooner designed for sail and power.

deal in these boats. If Davies wanted such a schooner, he would have to build his own—with an assist from son Morgan. Without detailed design plans, Davies realized he would be working virtually blind. During the 1920s and '30s, a maritime historian, the late Howard Chapelle, patiently tracked down and interviewed the few remaining boat builders. His writings on their hard-won knowledge became Davies' critical link with the schooner past. (Chapelle went on to become curator of maritime transportation at the Smithsonian's National Museum of American History.)

Working on his aborning schooner on a riverbank near his Sacramento home, Davies opted for steel rather than the traditional wood hull, and installed a heavy-duty diesel engine as a power back-up. He opted for versatile gaff-rig synthetic sails attached to a wood mast by round wood hoops that slide up and down easily. "It's pretty hard to run to a repair yard when you get in trouble out in the middle of the Pacific. You have to go with reliable gear even though you may not be able to raise as much sail as a racing yacht," he says, referring to the sport sailor's favored aluminum masts with metal-track sails.

By 1974, Davies' dream boat, the 57-foot *Cornucopia* (above), was ready to pursue albacore, working out of Honolulu. The albacore fleet, operating in hefty power boats, was skeptical about the "rag" sailor in its midst. Davies quickly proved he could catch fish. By the time the oil embargo really hit home, the fleet sensed it had a prophet in its midst. Today, Davies claims to pocket $2-3,000 in fuel savings on each run. In port in Honolulu, he plays host to a steady parade of fishermen and naval architects examining his switch to sail. He has a come-home capability that his peers envy; an engine breakdown at sea is the dread of fishermen.

The *Cornucopia*'s utility has expanded considerably since 1974. Government agencies like to charter the fuel-efficient vessel for long-distance exploratory fishing surveys. On one survey, each hired vessel was subsidized with $5,000 worth of fuel; at the end of the three-month job, Davies says he wound up with a fuel

"Smokestacks" of converted schooner in fact contain large rotors with which Anton Flettner tried in 1920s to drive propellers with wind.

Japanese motor tanker *Shin Aitoku Maru* carries two rigid sails that are computer-controlled, fold when not in use, achieve some fuel saving.

credit while the solely engine-driven boats had to pay as much as $3,000 above the subsidy.

The *Cornucopia*'s success has inspired a modest but growing demand for steel fishing schooners such as those built by Davies' son, Morgan (p. 53). In a farming area beyond Morro Bay, California, I spot a massive steel boat frame somewhat reminiscent of a reconstructed dinosaur skeleton sitting in Morgan's work yard. When a young man with a black beret set on a crop of red hair introduces himself, I wonder why a fisherman investing $250,000 and more in a new boat would contract with him rather than a major shipyard. "Because I'm a craftsman. I don't build plastic boats," he announces, "plastic" being his critical label for fiber-glass hulls. Pointing to a steel plate with hull lines drawn on it, he boasts: "I'll play chicken with any plastic boat in the water with these hulls." Many sailing vessels have a shallow, rakish bow to increase their speed. Morgan fashions a bow with a deep forefoot to dig into waves. "This vessel is built to work into the eye of the wind under power." For him, boat building is the means to raise the money that will enable him to follow his father's career at sea.

For Woniya, *50 tons of fish*

Jeff Smith (p. 52) of the "pirate ship" *Woniya*, built his first sailboat of plywood at age 12 when he was growing up in Seal Beach, California. His new boat is quite a bit larger: 71 feet long with a capacity for 50 tons of fish. It may be the largest steel fishing schooner yet built on the Pacific Coast.

Unlike their Western counterparts, fishermen on the Atlantic and Gulf coasts seem not to display as much interest in sail, but there is a surprising missionary of sail in these regions who turns out to be a tugboat captain. Lane Briggs and his son Jesse operate Rebel Marine Services out of Norfolk, Virginia. Some time back, Briggs decided to sponsor a sailing regatta, only to realize that he had no boat of his own to enter. Undaunted, he placed some salvaged sails on his tugboat, using an old boom as a mast. His makeshift rig was the nautical hit of the day. When a barge suddenly needed a tow, he stowed the rig and went to work. Once the tow was under way, however, his crew decided to raise sail and see what would happen. What happened was a 1.6-knot increase in speed and a handsome saving in fuel. The sails remain on *Steel Rebel.*

"If you save fuel with a rig like that," a waterfront neighbor observed to Briggs, "think what a new vessel designed for sail could do." Merritt Walter, a naval architect interested in building sail workboats, was about to get his first sailing client. Launched in 1980, the 51-foot *Norfolk Rebel* (p. 50) carries 1,400 square feet of sail on two masts and a bowsprit. Its aluminum

In what may be the last photograph of doomed *Leavitt* under sail, the schooner pulls away from Boston harbor in choppy seas with a capacity cargo en route to Haiti. One week later it sank.

masts are raked to help clear the bridges on Chesapeake Bay. To counter the heeling force of the sails, Briggs' "Tugantine" ® carries ten tons of lead ballast. The gaff-rigged sails require no extra crew to handle. I ask Briggs if the bowsprit gets in the way when a barge is being pushed rather than pulled. "No," he counters, "it's retractable."

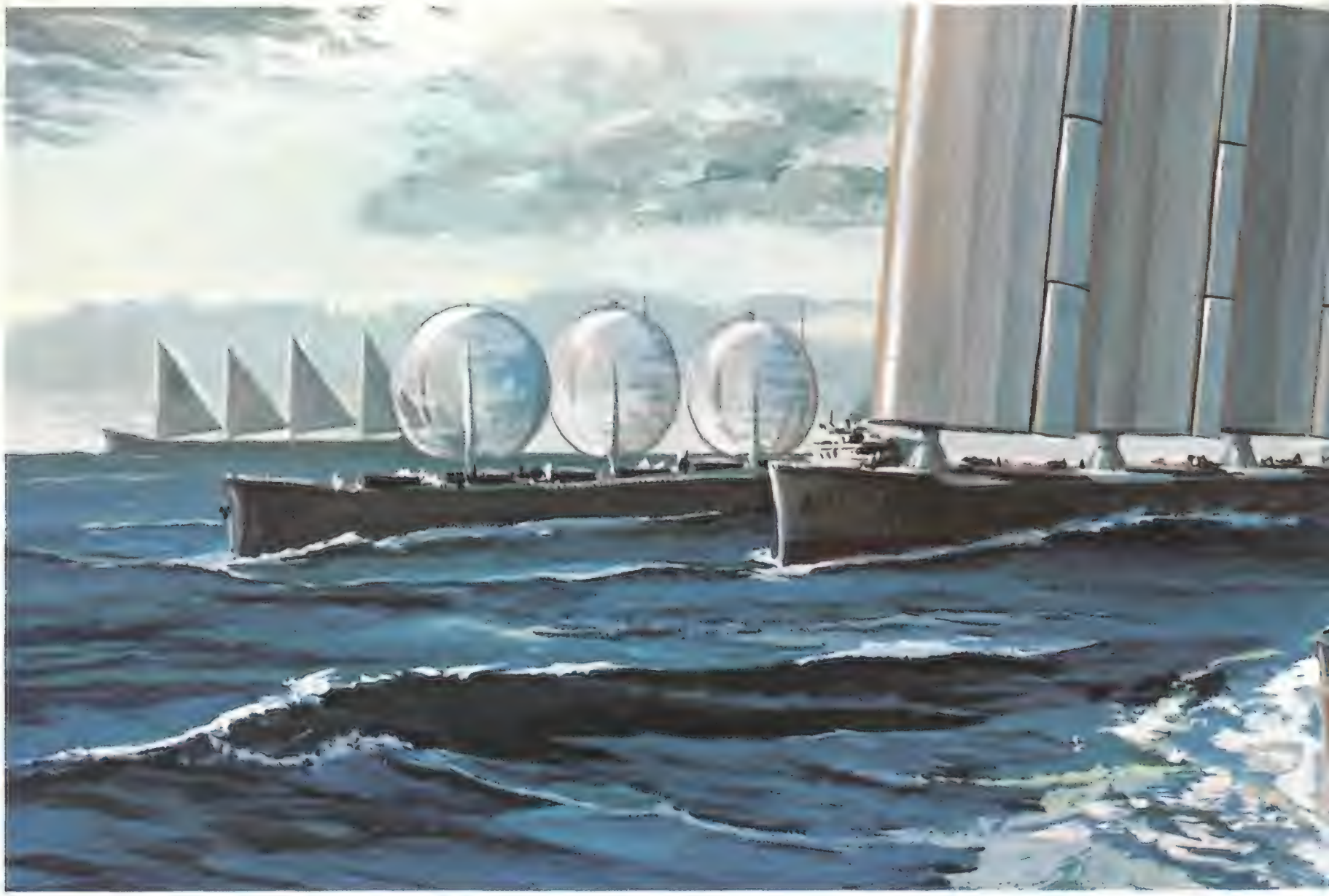
Sail-assisted *Steel Rebel* gets up to a 20 percent saving in fuel; *Norfolk Rebel*, its hull designed for sail, theoretically can get 40 percent and has a quadruple-threat potential: it can tow, fish, salvage or carry cargo. "The mast and boom can be used for loading or unloading," Briggs tells me. This versatility has not gone unnoticed: the National Marine Fisheries Service awarded a grant of $72,000 for *Norfolk Rebel* so that the economics of sail-assisted power boats could be studied.

While sail lends itself to fishing boats, sailing craft designed to carry cargo are generally less adaptable. They must, of course, be larger to compete with engine-driven ships, leading to the scaling up of components, whether sail system or hull. More crew can be needed; regulations and insurance requirements can be more rigorous, all adding up to increased costs and innovative or—depending on your viewpoint—questionable strategies. Consider the case of Ned Ackerman, a college English instructor with offshore recreational sailing experience, who, in 1975, believed that the energy crunch would spur a return to sailing cargo ships. He built a two-masted wooden schooner, the *John F. Leavitt* (above), to carry lumber from Maine to the mid-Atlantic states. Rather than install an engine, he decided to use a small 80-hp boat for maneuvering the *Leavitt* in harbor waters.

In the fall of 1979, the ill-fated schooner was launched and its itinerary drastically revised. Now bound from Massachusetts to Haiti on its maiden voyage, it carried a capacity load of lumber and tanning supplies. Some 280 miles southeast of Long Island, with winds gusting to 50 knots and seas building to 20 feet, the pitching ship slipped into a trough and began taking waves broadside. Helicopters rescued the crew, but the *Leavitt* was lost.

Even though the subsequent Coast Guard investigation of the mishap cited inadequate equipment and "the crew members' cumulative lack of deep-sea sailing experience aboard this type vessel" as "contributing factors," commercial sail proponents are sensitive to any ventures—like the *Leavitt*—that reinforce its image as unsafe and undependable.

Lloyd Bergeson's approach to commercial sail could not be more different. Bergeson is a lifetime yachtsman—he sailed singlehanded from North America to Norway in 1978—and has an impressive technical background as a nuclear submarine planning manager. He and a group of private investors have formed



Passing in review, an artist's conception of several propulsion systems studied by Wind Ship Development Corporation. From left: unstayed cat rig, single triangular cloth sails attached to free-standing masts; a vertical axis wind turbine looks like an eggbeater, uses wind from all directions; wing sail resembles airplane wing fixed upright on deck; horizontal

the Wind Ship Development Corporation in Norwell, Massachusetts, which has conducted a scientific appraisal of alternative ship designs and of the routes best suited to wind power. The U.S. Maritime Administration (MarAd) funded most of the research.

The study, released last March and titled "Wind Propulsion for Ships of the American Merchant Marine," ranks as the most extensive of its kind. Even non-conventional systems were evaluated: some sail proponents would tap the wind to turn a propeller rather than fill a sail; ergo, the study contains schematics of turbines or "windmills" on the bow of a ship (above). Unlike sails, the windmills could operate in all winds, with resultant energy transmitted by drive shafts and gears to the propellers. But the study also found deterrents to ship-based windmills: they would have to be as large or larger than the largest land-based units, some of which are 200 feet or more in diameter; the ship's motion could speed metal fatigue in such large structures; and windmills could present windage problems.

There is a precedent, according to the report, for a mechanical wind propulsion system. During the 1920s, a German engineer replaced the masts on some sailing ships with what appeared to be two giant smokestacks (p. 54). The "smokestacks" actually contained huge rotors. Anton Flettner was trying to exploit a phenomenon familiar to baseball pitchers: a ball with spin on it—such as a curve ball—wants to edge sideways to the wind. The rotors were designed to transmit this sideways motion to a propeller drive shaft. Although the Flettner ships were uneconomical to operate, the report concludes that the concept deserves further study.

As for sail, the survey found, not surprisingly, that traditional square and fore-and-aft rigs require large crews and interfere with cargo handling, while triangular cat rigs present fewer difficulties. The "most effective" rig in terms of aerodynamic performance, operation, safety and cost turns out to be the wing sail, which resembles an upright airplane wing and has received limited use in yacht racing circles. It requires no extra crew, no winches and no lines, and can be trimmed by rotating the mast to the appropriate angle

axis wind turbine (foreground) generates power with two blades, but suffers from metal fatigue problems; modern square rig, updated version of historic windjammer, trims sail mechanically; Princeton SailWing (named after inventor's university) carries only one cloth sail per mast, has proved too costly; stayed fore-and-aft rig with triangular sails is a yachting classic.

of the wind. It can be operated from the ship's bridge, with sensors to feed information on wind speed and direction. No lines mean minimum interference with cargo handling.

Some form of "sail assist" for engine-powered vessels could result in fuel savings of up to 15 or 25 percent, according to the Wind Ship study, with the added cost of the sail system offset by the smaller engine required. While the study determined that the most favorable winds are in the North Atlantic and North Pacific, the best trade opportunities exist in the Caribbean where smaller freighters, whose size is more amenable to sail assist, predominate. Finally, the study recommends that a ship prototype be developed to test these concepts and gain operational experience. Meanwhile, a Greek firm—Ceres Hellenic Shipping Enterprises—is already operating small freighters in the Caribbean, and Wind Ship has retrofitted one, *Mini Lace*, with a sail-assist system employing one unstayed cat rig. (Tests for a rigid wing sail are planned.) How do the skippers of Ceres' conventional vessels react to this plunge into sail assist? "One captain already jerry-rigs a sail out of tarpaulin to exploit favorable winds," says a spokesman for the venturesome Greeks.

Far larger sails than those on the *Mini Lace* are being developed in an industry not normally recognized as a wind-power partisan. Rowan Companies, Inc. of Houston, Texas, operates huge offshore oil-drilling rigs. Under tow, its jack-up rigs resemble enormous upturned bar stools with legs about 400 feet tall (p. 59). Company chairman C. R. Palmer wondered if a sail might not add speed and stability to the cumbersome platforms. He asked sailmaker Colin Ratsey of Ratsey and Lapthorn, Inc., in City Island, New York, to develop the needed size. (In the 1930s, Ratsey's father had made giant canvas sails that weighed up to a ton for the J-Boat series of racing sloops.) The two enormous Dacron sails that Ratsey produced weigh about 1,600 pounds each, with a 180-foot height and 75-foot base.

Once you get such mammoth sails aboard an oil rig, how do you raise and, more important, quickly lower them in the face of storm winds? Palmer and Ratsey installed an aluminum mast and a roller furl-

ing system that unwinds and winds up the sails in less than a minute's time.

Rowan Companies has used this sail system on long-distance tows from the Gulf of Mexico to Nova Scotia and to the North Sea. The added speed and stability justify the investment of several hundred thousand dollars in sail, according to Palmer. Today, Ratsey is helping another firm develop a sail-assist system for oil tankers. With large, open decks uncluttered by cargo booms, tankers could be spacious sail platforms.

This very prospect inspired a major Japanese shipbuilder, Nippon Kokan K. K. (NKK), to launch a small, sail-assisted motor tanker for the Aitoku Company, Ltd., in 1980. The *Shin Aitoku Maru* sports two sails mounted on rotating masts. Like the wing sail, they are rigid, consisting of stiff canvas stretched over a steel frame. Computers that sense wind direction and speed trim the sails, which fold when not in use (p. 54). Fuel savings are "roughly 10 percent."

One political aspect of the *Shin Aitoku Maru* is as significant as all of the technical aspects: the project was funded on a joint industry-government basis. The Japanese have thus signaled their intent to work on sail technology in a more aggressive manner than the Americans. U.S. leadership in sail technology, built up over a century in the private yachting sector, could be co-opted for commercial projects by other nations.

But sailpower has friends on Capitol Hill. Senator Spark Matsunaga of Hawaii has convinced Congress to authorize a feasibility study on sail to be conducted by the Department of the Interior, administrator of the U.S. Trust Territory of the Pacific Islands. There, Interior funds intra-island freighters that may have to reduce service as fuel costs spiral. Some island residents depend on these boats for mail, food and medical aid. Sail-assist technology could promote self-sufficiency and cut fuel bills.

Matsunaga now wants to extend the existing federal energy tax credit for wind-based systems to sail-assist projects. Senator John Warner of Virginia has co-authored a bill with him for this purpose. To these legislators from opposite ends of the continent, this is a more effective response to the energy crunch than fuel subsidies. After hearing sail put down as an "exercise in nostalgia," Matsunaga is said to have called exclusively engine-driven vessels "old fashioned."

Today's sail enthusiasts are indirectly haunted by the specter of a sailing disaster that occurred almost 75 years ago. The schooner *Thomas W. Lawson* (p. 51), launched in 1902, was built to hold its own against more efficient engine-driven ships by virtue of its size: 395 feet long, with seven 193-foot masts carrying a whopping amount of canvas. And therein lay the seeds of disaster. The sails and masts presented such a large surface to the wind that the schooner was difficult to handle; with an inexperienced crew, it sank in a storm off the coast of England. Rather than being a savior of commercial sail, at the time the *Lawson* helped convince marine insurance agents and investors that engine-driven ships were safer.

To MarAd and the National Marine Fisheries Service, commercial sail remains too experimental for much traditional funding. The IRS provides tax credits for certain wind-assisted technologies, but not for ship propulsion. Thus, contrary to sail's enticing image as an energy-efficient, technically advanced and environmentally benign alternative to fuel-guzzling power vessels, sail proponents must contend with myriad technical, economic and political problems of which the price of fuel is only one consideration.

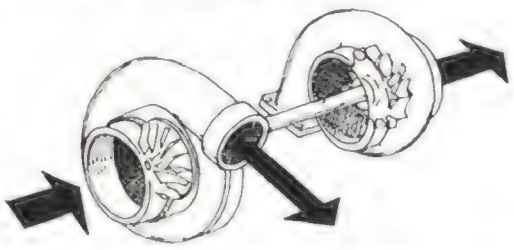
Yet anybody can chase the wind, and catching it for a profit remains an enticing challenge. Consider 35-year-old Greg Brazier of Long Island: in his back yard he is building a two-masted cargo vessel from a design by the architect of the Briggses' *Norfolk Rebel.* When he launches the 57-foot steel-hulled *Phoenix* next spring, he will be able to carry 20 tons and at least 16 passengers. His trade route? A Long Island Sound run between Bridgeport, Connecticut, and Port Jefferson, Long Island. Brazier feels that his budding Atlantic Packet Lines will fill a market need. By land, the distance between these cities is about 75 miles; by sea, 15. Local manufacturers must deliver and collect by the congested land route. He sees the *Phoenix* as a "volksboat"—a UPS of the Sound. "If I can get one-half of one percent of the traffic between those areas, my business will be fantastic."

An innovative use of sail adds stability to a jack-up oil rig during long-distance tow.

CHARLES
H
ROWAN

A car that captures energy lost in the tailpipe and recycles it to give you "free" extra power: The Peugeot turbocharged diesel.

Two trucks lumber up a long, steep hill, their exhausts bellowing. A car noses out from behind them. It looks safe to pass. Or is it? The car is a diesel, and a diesel's strong suit is fuel mileage, not swift acceleration.



The exhaust-driven turbocharger blows a 600-mph whirlwind that "packs" the engine with 13% more horsepower, 35% more torque.

The driver presses down on the accelerator pedal... and starts a fascinating chain of events.

Under the hood of the car, a tiny turbine wheel begins to spin ever faster; it will eventually reach a speed of up to 100,000 revolutions a minute.

A 600-mph whirlwind is created that literally stuffs the combustion chambers with power.

The pressure on top of each piston rises to nearly 13 *tons*.

Gathering momentum, the car surges past one truck, and then the other, and quickly dwindles to a dot on the horizon.

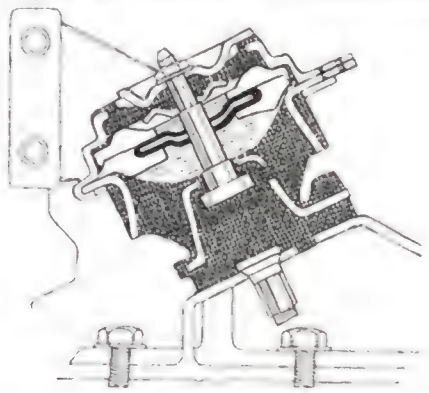
Zero to 50 in 11.2 seconds

This was no ordinary diesel. It was the Peugeot 505S Turbodiesel.

Exhaust gases that normally would be wasted have been harnessed by a turbocharger to provide "free" extra power: 13 percent more horsepower, 35 percent more torque.

The Peugeot 505S Turbodiesel has extra power on demand for passing situations like this.

This 5-passenger sedan, weighing a ton and a half, will reach 50 miles an hour in 11.2 seconds.



The engine has its very own suspension system. Tiny hydro-elastic shock absorbers like this are one reason why the 505S Turbodiesel feels so smooth.

Although the performance of the Peugeot Turbodiesel yields little to comparable gasoline-engined cars, it has not sacrificed any of its diesel miserliness with fuel: 28 EPA estimated mpg, 36 estimated highway mpg.* Proof that you do not have to switch to a "downsized" car to live with today's bloated fuel costs.

Important note: 85 percent of the diesel engines sold in the U.S. are actually gasoline engines converted to burn diesel fuel. This is not Peugeot's way. Every Peugeot diesel is a *true* diesel. It is designed from scratch to withstand the enormous internal pressures of diesel combustion: the Turbodiesel's compression ratio is two and one-half times that of a gasoline engine. Engine blocks are

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The Peugeot Lion

The lion has represented Peugeot since 1858. It was Peugeot that built the first car ever sold commercially (1891)... the world's first diesel-powered car (1922)... and the first high-rpm diesel engine (1967).

A suspension of awesome efficiency

Normally, shock absorbers are designed to provide either a soft ride *or* good handling... but not both at the same time. The Peugeot shock absorbers, however, are awesomely efficient dampening devices. They will swallow large bumps without breaking stride *and* deliver excellent handling.

Cut apart a Peugeot shock absorber and you will discover its secret: the piston contains *four times as many valves* as a normal shock absorber.

Every car is tested

After the car comes off the assembly line, it is put to a test that is extremely rare today. Every single Peugeot is taken to a special track where it is tested by one of a 75-member team of expert drivers. It must meet Peugeot's standards or it is not permitted to leave the factory.

Peugeot has little tolerance for a poorly made car.

The meaning of "S"

Peugeot does not believe in nibbling you to death with extra-cost options. When you spend $15,510** for a 505 S Turbodiesel, this is the "S" (for Special) equipment that comes with the car:

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Electric sunroof

Cruise control

Digital AM/FM stereo radio with Seek/Scan tuning and four speakers

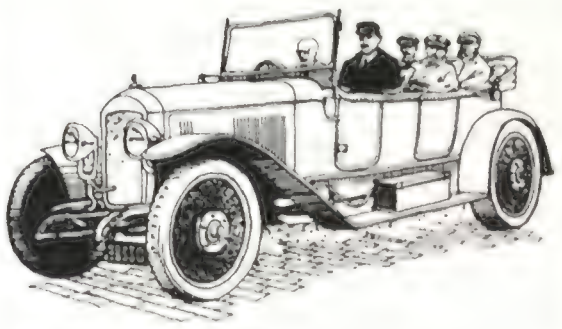
Automatic electric antenna

Central door-locking—a twist of the key locks all four doors

Alloy wheels

Multi-adjustable driver's seat.

So fully equipped is the 505 S that the only other ways to spend your money are by ordering a 3-speed automatic transmission ($360) in place of the manual 5-speed overdrive gearbox, and by specifying metallic paint ($290).



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In a Northern Trail snowstorm, visitors in monorail cars pass Bactrian camels from Asian steppes.

By Jeffrey P. Cohn

From Arctic to tropics in a new zoo that reflects the natural world

Photographs by Annie Griffiths

Be it icy or steaming, for a wild animal there's no place like home—unless it's Minnesota's innovative zoological park

"Look at them, look at them go!" Ed Kohn exclaimed in a gentle voice. "Aren't they beautiful?" Kohn was speaking to no one in particular. Earlier he had been expounding on his thoughts and hopes for Minnesota's new zoo, which he heads. Now he was gazing out his office window as a pair of long-necked trumpeter swans swam gracefully across a deep-blue pond.

Except for a wooden bridge across the pond and a dirt road on the other side, hardly a trace of civilization can be seen. The swans share their pond with wild Canada geese, wood ducks, muskrats and mink. Off in the distance, spruce, aspen and oak trees stretch their limbs toward a pollution-free sky.

One of the newest zoos in North America, the Minnesota Zoological Garden brings a sense of the wild to its displays of exotic and familiar animals. Unlike most traditional zoos, this zoo of the future specializes in larger numbers of fewer species rather than smaller numbers of a lot of species. It features animals, plants and natural settings drawn from four distinct geographical regions: the world's northlands, Minnesota, tropical Asia and the oceans.

The setting has 'an element of discovery'

The Minnesota Zoo occupies a 480-acre site in Apple Valley, a 20-minute drive south of Minneapolis and St. Paul. Despite advancing suburbs, the surrounding area still retains much of its natural quality from earlier times. Trees and cattails hide the marshes and glacial ponds that dot the lowlands near the confluence of the Mississippi and Minnesota Rivers. Muskrats scurry along the shores while herons stalk the shallows for frogs and salamanders. Overhead, hawks and owls scan the ground below for prey.

Such is the setting for what Kohn, former deputy director of the Smithsonian's National Zoological Park, describes as a theater of the wild. "A zoo is a participatory theater," he says. "Like any good theater, it contains an element of discovery. People must invest time to discover an animal's beauty in a setting that closely resembles its natural environment. And, as in any good play, neither we nor the viewers know how it will unfold. We don't always know exactly where the animals will be or what they will be doing."

At this zoo, too, the play varies as the seasons change. Ponds glisten in summer sunlight, but are blanketed with snow and ice in winter. The green leaves of spring and summer give way to brilliant hues of red, yellow and orange in autumn. As the animals and their environment change with the seasons, one gets different perspectives. "This," says Kohn, "is truly a zoo for all seasons."

Separate trails take one through the zoo's four regions, each arriving back where it started. The North-

ern Trail, to my mind the most distinctive trail, leads one on a walk around the world's northlands. There, animals whose native climates are similar to Minnesota's—where temperatures can dip to −30 degrees F in winter and reach 100 degrees in summer—live outdoors all year round in multi-acre enclosures.

Here Siberian tigers (p. 67), largest of the cats, roam enclosures totaling 4.5 acres of densely wooded north-Asian forest. Musk-oxen paw at snow that covers their winter tundra to get at the grass below. Moose cross a frozen bog that in summer offers relief from heat and insects. Pronghorn pause from grazing on summer forbs to poke their heads above the tall, windblown prairie grasses.

Nearby, short-legged Mongolian or Asiatic wild horses and two-humped Bactrian camels (pp. 62-63) share a 14-acre central-Asian steppe or grassland whose gentle slope permits the animals to pass under a wooden walkway. Great gobs of loose hair hang from the camels as they shed their thick winter coats with approaching summer.

Overhead, a monorail carries one leisurely and quietly above the Northern Trail, providing yet another view of the animals and their environment as well as protection from winter winds. As the monorail glides over the musk-oxen exhibit, a large, gregarious snapping turtle may rise from a lily-studded pond during warm months. Near the monorail's start, Japanese macaques or snow monkeys (see cover), the northernmost primates except Man, chase playfully after one another in a setting much like their natural home.

In sharp contrast to the Northern Trail on a cold winter day, tropical Asia has been re-created indoors in one of the zoo world's most unusual structures. A multilevel pathway takes one on an imaginary 3,000-mile expedition that begins in the arid highlands of western India and descends through steep mountain passes to the broad coastal plains, meanders through the humid monsoon jungles of southeast Asia, and ends in the lush rain forests of Indonesia.

Housed throughout 1.5 sunlit acres of the Tropics Trail are more than 650 animals from Asia. Agile Nilgiri tahr, "relatives " of goats and sheep, bound about on precarious ledges overlooking a deep river gorge. In the valley below, small-clawed otters forage in the shallows of a fast-running stream. Sloth bears grunt and snort loudly as they suck fresh honey from a hollow log. Dim shafts of soft artificial moonlight spotlight nocturnal leopard cats, giant Indian fruit bats and the bearlike binturong, the only Asian mammal with a prehensile tail. Four separate aviaries house more than 50 species of birds, including the magnificently colored great Indian hornbill.

A maze of bamboo, bananas, palms, cycads, jasmine, figs, orchids, hoya vines and other vegetation native to Asia drapes each exhibit, adding to the sense of the wild. In all, 15,000 plants and trees from 500 species grow under a 75-foot-high canopy that focuses maximum sunlight on the delicate foliage (opposite).

What does a weasel look like?

From the tropics, turn a corner and an enclosed walkway leads to animals and settings native to Minnesota. "Many people who come here have no idea what a weasel or a woodchuck looks like," says Sanford Friedman, the assistant director for biological programs.

Real-looking rocks modeled from bluffs overlooking the nearby St. Croix River provide natural havens for lynx, pumas, ravens, hawks and owls. In the water below, North American river otters (p. 67) catch live fish or frolic about much as they would in a northern Minnesota stream. Weasels, whose long, slender bodies enable them to invade the burrows of rodents and other small animals, scamper over rocks and branches as if to show off their athletic prowess.

A little farther down the walkway, another stream broadens into a deep beaver pond. The pond and its shores are inhabited by ducks, turtles, frogs and salamanders, much as they would be in the wild. A closed-circuit television camera, one of a dozen in the zoo, shows the beavers in their lodge quietly dining on fresh saplings they cut down themselves (a total of 740 trees in 1980!) The beavers and their eight kits—all born since 1979—store extra saplings in the water outside their lodge for winter eating. But the beavers don't always follow the script set out for them. Take the time they piled branches in front of the camera to

The Minneapolis-born author, a self-described "zoo nut," is a free-lancer who specializes in science and technology, and often writes about animals.

Gerald Brimacombe

This white-cheeked gibbon, at a lookout perch on Tropics Trail, is now a mother.

Two Celebes apes, natives of an island in Indonesia, live along the zoo's Tropics Trail.

Sunshine streams through the roof of a brightly daylighted area of the Tropics Trail. The directors of the zoo proudly call this "one of the most extraordinary structures in the zoo world."

Near children's zoo on Discovery Trail, skiers trade sizing-up looks with a Fjord horse.

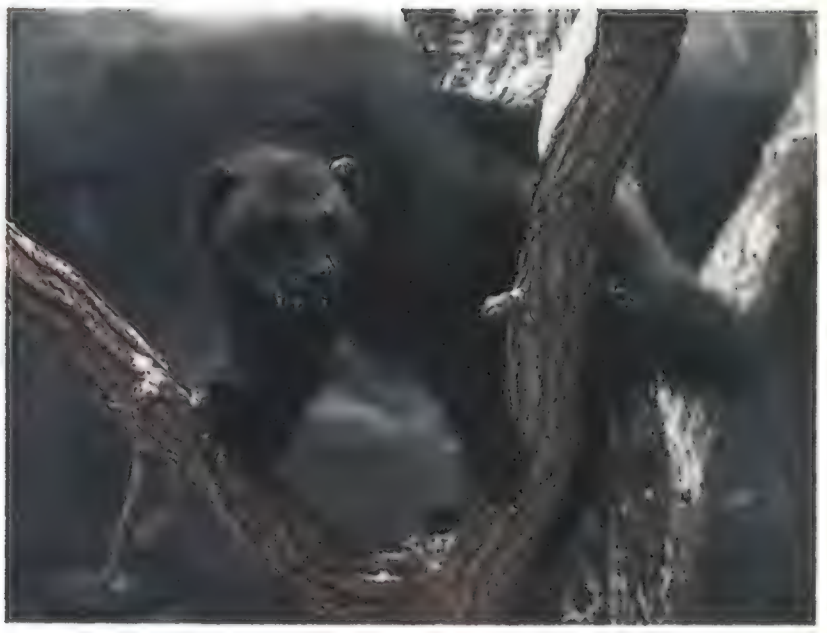
Two massive bull elk, also known as wapiti, spar in the snow beside the zoo's Northern Trail.

screen their kits from view and wouldn't maintain the dam as keepers had hoped. But there now seems to be a reasonable truce: the beavers don't tear down the dam and the keepers don't remove all the branches.

The Ocean Trail displays one of the zoo's main attractions—two beluga or white whales. One of nature's most fascinating creatures, the beluga is one of only two whales (the other is the narwhal) able to turn its head from side to side. Hydrophones placed in the 500,000-gallon tank permit one to listen as the belugas "talk" to each other or their trainers.

Outdoors, hidden behind clusters of trees on top of a rise, large stables house the resident herds and rugged individuals of the Northern Trail. Each is designed for a specific species. Thus the social Mongolian wild horses, camels and musk-oxen have large corrals, while the solitary moose have separate stalls. Here is where the animals are fed and housed at night, allowing keepers to observe their charges individually on a daily basis.

Since most animals in zoos as well as in the wild are often inactive, much to the consternation of zoo visitors who want to see them "doing" something, the Minnesota Zoo continuously rotates two or more sets of some two dozen species to present active animals.



A solitary wolverine peers out from tree branches on the Minnesota Trail.

Near the frigid Northern Trail, two Siberian tiger cubs wrestle in the snow.

In the case of the weasels, a veritable apartment of wire cages backstage houses more than a dozen individuals from three species. Like actors entering and exiting the stage, the weasels are shuttled in and out of their enclosure every 60 minutes.

Through its exhibits, the Minnesota Zoo helps to educate people about natural ecosystems. Each exhibit becomes a stage for learning, with discovery of natural relationships the pervasive theme. Thus, the zoo gives live food to as many of its animals as possible. In addition to the otters, insect-eating birds in the Asian and Minnesota aviaries are fed live prey. In other exhibits, food is scattered about so the animals have to search to eat, much as they would in the wild.

The zoo also uses exhibits to illustrate predator-prey relationships. In the Asian tropics, a boldly patterned Burmese python finds its home next to that of the tiny Malay chevrotain or mouse deer, one of its prey in the wild. Farther on, the elephant trunk snake uses its barbed scales and looped body to catch live fish that swim about its murky pool. Among Minnesota wildlife, the great horned owl, red-tailed hawk and grey fox are lodged together to show that their natural habitats overlap and to illustrate predators that hunt by different methods or at different hours.

A North American river otter skids down the snow slide in Minnesota Trail exhibit.

Subsurface view of whale tank on Ocean Trail gives visitors intimate look at a zoo beluga.

Not far away, in the main zoo building, one can meet smaller animals nose-to-nose in the ZooLab. A water-filled tank contains numerous starfish, sea anemones, sea cucumbers and barnacles that kids and the young at heart can hold. One also can cuddle Siamese satin and French lop-eared rabbits or touch various snakes and tarantulas. Two large, brightly colored Amazon parrots and a macaw squawk loudly while nearby one has to look hard to find the green frogs, salamanders and anoles in various terrariums.

To underscore this commitment to enlightenment, the zoo invests significantly in education. More than 60,000 students visit the zoo each year, while another 50,000 are reached through a traveling zoomobile and outreach series. These efforts, buttressed by the work of hundreds of supporters and volunteers from the community, won for the zoo in 1979 the American Association of Zoological Parks and Aquariums' award for institutional commitment to education.

The zoo's visual delights often mask another serious side to the work of all zoos today: the genetic custodianship of species extinct or endangered in the wild. For many species, zoos are their last chance for survival. "Zoos must and have become net producers of animals," Ed Kohn says, "not just consumers as before." This zoo is confident it can meet the challenge. "Ideally, we can successfully breed any animal," Sandy Friedman adds. "All it takes is finding the right combination of social and environmental conditions and the right food."

Toward that end, the Minnesota Zoo, in association with other zoos, has joined with the Smithsonian's National Zoo to breed Bactrian camels (SMITHSONIAN, January 1980) and Mongolian wild horses, also called Przewalski's horse after the Russian general who first described them to Westerners a century ago. By cooperating with other zoos in the United States and Europe, the two zoos are acquiring enough animals to mate through successive generations without increasing inbreeding, which neither zoo could have managed alone.

The last truly wild horses, Mongolian wild horses may be extinct in their native Gobi Desert in central Asia. None has been seen for sure since 1968, although an unconfirmed sighting was reported last spring. To improve their breeding prospects in captivity, Minnesota's 13 horses have been divided into subherds of one male and three or four females each. Stallions naturally gather harems and chase other reproductive-age males away. By keeping only one subherd on display at a time, the zoo prevents fights among its males and shows the horses' natural social grouping. It must be doing something right: four foals have been born in the last two years.

An even greater challenge is presented by the false gavials, unusual crocodilians from Malaysia and Indonesia that use their narrow snouts and daggerlike teeth to catch fish with swift side-to-side head swipes. No United States zoo has successfully bred false

Jim Brandenburg

Beaver lodge (shown from underwater) also can be seen on closed-circuit TV screen.

gavials. The Minnesota Zoo has designed enclosures with enough room for these prehistoric-looking reptiles to build and defend nests. Plenty of vegetation has been supplied for nest building and minerals are added to the diet to ensure proper nutrition.

Up a steep ledge overlooking the false gavials, the Nilgiri tahr are the subject of an experimental artificial-insemination program. An endangered species from southern India, Nilgiri tahr differ from true goats in having short, curved horns rather than long, sweeping ones. The 30 animals in the Memphis, San Diego and Minnesota zoos are the only known Nilgiri tahr outside Asia (p. 70).

By using artificial insemination, Minnesota's zookeepers hope to increase their herd's gene pool by allowing more than one male Nilgiri tahr to sire young while retaining the herd's dominant male social structure. Artificial insemination also avoids the possibility of injury or death in shipping animals between zoos while allowing a male in one to impregnate a female in another, thus increasing the gene pool.

After five natural births, the Minnesota Zoo inseminated a female artificially. No pregnancy resulted. After letting nature take its course for a while, zookeepers plan to try again. Later, if artificial insemination works, the zoo hopes to obtain government permits to import semen from wild Nilgiri tahr, again increasing the genetic diversity of captive animals. Also, once artificial insemination succeeds, the zoo may try to extend it to clouded leopards, white-cheeked gibbons (p. 65) and other endangered species.

Actually, all zoos risk inbreeding without new approaches. All 350 Monogolian wild horses in captivity, for instance, are descended from a dozen animals taken to Europe earlier this century. For many years, zoos and private owners failed to plan proper breeding programs. Consequently, stallions were sometimes mated with their own daughters or brothers with sisters. The result: inbred foals that are more susceptible to genetic defects and have lower fertility and higher death rates. While inbreeding does not always spell disaster for a species and may be unavoidable when working with small numbers, zoos seek to mate unrelated individuals.

A quick fix for an ailing tapir

To help zoos find appropriate animals for breeding, a computer-based information system housed at the Minnesota Zoo tells 150 participating zoos in the United States, Canada, Europe and New Zealand the name, age, sex, location, birth, death, sale and loan records of 90,000 animals, including 50,000 living ones. Known officially as the International Species Inventory System, ISIS was founded in 1974. It is used to identify which zoos have what animals, to clearly establish genetic lines of descent and to project future population growth among captive species.

Now, ISIS also collects physiological data. "If you have a sick marmoset or tapir, there isn't time to check the literature for what is normal," ISIS project director Nathan Flesness points out. "You have to treat that animal now." ISIS circulates data that enables zoo veterinarians to check known ranges for temperature, weight, hormone levels and various blood cells, proteins and gases in both sick and well animals.

Through such carefully planned breeding programs, zoos hope to maintain and perhaps increase the genetic diversity of captive populations and to restore to the wild at least some species that are now extinct in their native habitat. Toward that end, the Phoenix and San Diego zoos, along with the World Wildlife Fund-International, supplied animals to a reserve in Jordan for zoo-born Arabian oryx, and the National Zoo helped return the nene or Hawaiian goose to its native islands. Now, the Minnesota Zoo may participate in a restoration project closer to home.

In Tropics Trail building, zookeeper John Lewis holds a day-old Nilgiri tahr.

Until early in this century, woodland caribou roamed northern forests of the coterminous United States, but their native habitat was severely altered by logging and forest fires. As the habitat changed, deer (carrying a parasitic worm) and farmers arrived. Plagued by the parasite and subsistence hunting, the caribou disappeared.

Today, conditions in far northeastern Minnesota once again favor caribou. Logging is now completely controlled (Boundary Waters Canoe Area) and forests are reclaiming some open areas. Further, the government has set aside large tracts of land for national forests and wilderness areas where access is limited. As the forest matures, the deer and wolves decline.

The Minnesota Department of Natural Resources (DNR) is contemplating the release of caribou into the northeastern Minnesota wilderness. If things work out, the Minnesota Zoo, along with the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the Minnesota chapter of the Safari Club International, a hunters' group, hope to help the DNR establish a caribou nursery herd at the zoo. Repeated and carefully monitored releases of caribou born in captivity to parents captured from the wild in Canada, where they are still plentiful, are planned for remote Little Saganaga Lake in Superior National Forest. It is hoped these caribou will not leave the area of release.

To house the caribou, the Minnesota Zoo will complete a part of the unfinished Northern Trail. Already, American bison and elk (or wapiti) have been added (p. 66-67). The completed Trail will include walruses, polar bears, wolves and smaller animals like arctic hare. Later, still another hoped-for outdoors exhibit will display larger Asian animals such as the Indian rhinoceros, Asian elephant and orangutan, although some may need indoor quarters in winter.

The Minnesota Zoo has achieved much since opening in May 1978. Along with these achievements, however, have come controversies. Early critics charged that animals often were not to be found in their spacious quarters. The zoo responded by redesigning some enclosures to encourage their inhabitants to show themselves more often. And the animals themselves adjusted to their new surroundings and visitors.

Also, annual attendance has failed to meet overly optimistic projections based on expected population growth in the Twin Cities area made before the zoo opened. As a result, the zoo has not become self-supporting as planners had hoped. Still, with 1.1 million visitors the first year and 958,000 the second, the Minnesota Zoo outdraws all other state attractions and most other northern zoos that charge admission (this zoo charges $3 for adults; $1.50 for ages 12-16 and 62 and over; $1 for 6-11; and is free for 5 and under).

Despite such growing pains, the zoo remains what General Director Kohn calls it—a theater of discovery. Like members of a cast, its animals act as emissaries from the natural realm to Man's. Discovery and preservation of rapidly vanishing natural realms get to the heart of Kohn's view of why zoos exist. "The cause of the zoo is the discovery, understanding and thus love of wildlife for the sake of both its and our future," he says.

As important as that cause is, zoos still depend on the people who come to see the animals. "Our job is to bring people enjoyably to the cause," Kohn adds. "We owe it both to the animals we bring into captivity, and to ourselves." By creating a natural theater for the discovery of the wild, the Minnesota Zoological Garden entertains as it gives a renewed sense of our environment and its wildlife.

On the Minnesota Trail, a Canadian lynx makes itself at home in frozen waterfall.

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Museo Nazionale Duca di Martina, Naples

Filippo Falciatore's *Perseus Rescuing Andromeda from the Sea Monster* probably was sedan chair panel.

The Art Institute of Chicago

Lined in gold, highly decorated porcelain basin and ewer are from the Royal Porcelain Manufactory.

By John Canaday

Sumptuous art of Naples under Bourbon rule

In the shadow of Vesuvius the 18th century was a Golden Age of creativity; its fruits are now on display in a major exhibition

Ask Italophiles with some knowledge of art and history to name the Golden Ages of major Italian cities, and the first answers come readily. Florence? The 15th century, of course, the great days of the Medici with Lorenzo the Magnificent at the political apex and Leonardo da Vinci as the culminating figure in the attendant galaxy of artists, architects and intellectuals. That's the easy one. Rome? You have to choose between Caesars and Renaissance popes, one or two of each, with the Forum and St. Peter's as the foci of the Golden Ages that produced them. Venice, if it can be regarded as a city rather than a dream, is so perpetually golden that to speak of its Golden Age is hyperbole. Even so, give Venice the 15th and 16th centuries as Queen of the Seas with her own glorious court of painters. One more: Milan? Well, possibly its Golden Age is right now. In spite of the presence of Leonardo's *Last Supper* and the city's famous late medieval cathedral, which were essentially importations, Milan is Italy's monument to the ideals, crass though they may be, of the 20th century. This point could be argued. But Naples? Mention the Golden Age of Naples and you are likely to draw a blank.

This crowded, noisy, battered city is loved for its living legend, triumphantly transcending that legend's reduction to cliché and its frequent disproof, as any tourist can testify. Naples is loved as a city of gaiety, for its songs and dances, for its picturesque shabbiness rather than its spots of elegance, its home-style pasta more than its tony restaurants, its popular culture rather than its 757-year-old university, and always, above all, for the unparalleled beauty of its setting, with the cone of Vesuvius rising above the hills that form the Bay of Naples.

But a Golden Age? That convergence of wealth,

Art critic and author, most recently, of What is Art? *John Canaday wrote on the New American Realists in the October* SMITHSONIAN.

The Detroit Institute of Arts

A virtuoso recorder of the aristocratic life,
Falciatore painted *Concert in a Garden* about 1750.

power and creativity in the arts at the summit of a city's or a state's history? Except for art historians, few people could define a Neapolitan school of painting, much less place it in a period that could be called Golden. All but the most assiduous readers of guidebooks are likely to skimp the sections on Neapolitan history in order to get to the part on Pompeii.

Vesuvius did not entomb a Neapolitan Golden Age when it buried Pompeii under cinders and ashes. Naples, or rather Naples' ancient ancestor (called, in various references, Parthenope, Palaepolis and Neapolis), had been a small Greek settlement so attractive to Roman poets and intellectuals for a cultural tradition they admired (Vergil, who often visited there, is buried nearby), and to prosperous Romans for its site, that Rome annexed it by conquest in the fourth century B.C. Later—in the first century B.C.—Rome attached Pompeii as a port and a resort. With Pompeii buried in A.D. 79 Naples, through the centuries, lost any memory of its Roman past comparable to that of other Italian cities where that past left monuments. The discovery of Pompeii and the first excavations, which stimulated a classical revival throughout Europe, took place after the Golden Age of Naples was well under way.

In view of all this, "The Golden Age of Naples: Art and Civilization Under the Bourbons 1734-1805," is as unexpected and refreshing an exhibition as has come to the United States in a long while, partly because so many of the paintings, sculptures and decorative objects are unfamiliar (some are making their first excursion outside Naples) but largely because, in almost the theatrical sense of the word, this is a great show. Even the more familiar material—there are numerous important loans from American museums—takes on new freshness and vivacity enmeshed in the context of a period that until now has not been given a cohesive art-historical treatment.

The city of Naples during the period isolated here was the capital of the autonomous double kingdom of

Naples and Sicily, which included the entire lower half of the peninsula, and the island of Sicily. With its 400,000 inhabitants (less than a third its present size) Naples was not only the largest city in Italy, leaving Rome well behind, but the largest in all Europe except for Paris and London. In contrast with his cousins Louis XV and Louis XVI, who would give the family a bad name in France, Charles Bourbon, who came into power in Naples in 1734 at the age of 18, turned out to be an able administrator and an astute and relatively democratic politician. And he was a patron of the arts, which has endeared him to posterity. The exhibition—or show—celebrating the period he initiated was organized in Naples by a committee of international scholars. In its American version it is a joint project of the Detroit Institute of Arts, where it was held from August 11 to November 29, and the Art Institute of Chicago where, after opening January 16, it will close March 14, 1982. Looking over the Detroit installation just before the opening, J. Patrice Marandel, coordinator of the show in America, said with justifiable satisfaction, "It's a very happy exhibition."

A golden evocation of Naples

And indeed it is. Even among the most grandiose religious paintings and on through portraits, genre scenes, sculptures, tapestries, silver (including one ten-foot-high candlestick), porcelains, medals, and such surprises as a steel, ivory and gold hunting dagger in a sharkskin case, Naples' legend is evoked at full force, with a sumptuousness implying that life in the Golden Age was indeed golden for everybody.

Which, of course, it wasn't. Able though he was in administration and reforms, Charles Bourbon could not solve a problem that has a familiar ring today in New York, among other American cities. The poor, attracted by the city's wealth, crowded into it in such numbers that they could be neither employed nor properly housed. But if the function of art is to reflect the ideals rather than the contradictory facts of a civilization, the Neapolitan artist achieved that goal splendidly. When beggars were shown in genre scenes, they were given the bodies of athletes set off by rags and tatters designed in the spirit of *commedia dell'arte* costumes. In Filippo Falciatore's *Concert in a Garden* (opposite) a poor woman with her baby observes the scene from an arched opening in the background (an unlikely circumstance in the first place), but her good looks, her health and cleanliness, and the attractiveness of her costume make her anything but an intruder. Her wistful expression is that of a good actress.

Falciatore, highly successful and active in Naples from 1728 to 1768, was a consummate professional who, in addition to paintings like *Concert in a Garden*, produced everything from large altarpieces in a windy baroque style, frescoes in palaces and the vaults of churches (these now unhappily destroyed) to small ornamental panels such as a delightful one in the current show, *Perseus Rescuing Andromeda from the Sea Monster* (p. 74). Telling its story in luscious colors against a gold ground, the panel probably was incorporated in a sedan chair. It easily explains why visitors from other European capitals, at a time when sedan chairs everywhere had attained heights of opulence, found that those in Naples were the most opulent to be seen anywhere.

Historically, the preeminent Neapolitan painter of the late 17th and early 18th centuries was certainly Francesco Solimena, whose birth and death dates, 1657-1747, show that he was already 77 years old when the Bourbons came to power. Solimena is represented in the exhibition with superbly flamboyant paintings of religious subjects and an almost arrogantly self-assured self-portrait (below) of such technical bravura that his self-esteem must be forgiven as justifiable. Although a Neapolitan of the Golden Age, Solimena, much in demand outside Naples, is rather a member of the band of baroque predecessors who flourished in various cities in Europe and were virtually interchangeable in the conceptions of their admirably proficient work, whatever personal touches

Museo Nazionale di San Martino, Naples

Francesco Solimena, noted Neapolitan painter of the late-17th-early-18th centuries, by his own hand.

Palazzo Reale, Caserta

Mirror-framed console is one impressive example of the art of furniture making in 18th-century Naples.

they managed to impose upon the uniformity of an international style.

Included in the exhibition among these precursors is another internationally patronized Neapolitan, Paolo de Matteis (1662-1728) who—in spite of some extraordinarily dull paintings in which he sought to beat Solimena on that master's own ground—painted a slyly humorous and hence very Neapolitan satire on the baroque grand manner that he himself usually adopted—*Self-portrait with Allegory of the Peace of Utrecht and of Rastatt* (p. 80).

Not all historians agree that de Matteis' intention was satirical, yet the tongue-in-cheek approach seems inescapable. In his dressing gown and nightcap, the artist is holding a levee attended by allegorical representatives of Peace, Plenty, Faith, Hope, Charity and others, all swirling and attitudinizing in the grand baroque manner, while Atlas himself takes over as an easel for the painting in progress.

In a vignette at the extreme lower right, the lion, lamb, and little children are emissaries from the Bible's Peaceable Kingdom, while a monkey just behind the artist, turning its head to regard the mayhem going on beyond its shoulders, symbolizes the imitative function of art. In spite of its extreme complications and dozens of actors, the whole irreverent mélange is expertly organized and exquisitely painted; no sacrifice of technical mastery is involved in this immolation of baroque formula.

In its singularity, de Matteis' satire forecasts painters of lesser reputation than his and Solimena's, who were to give a specifically Neapolitan cast to the amalgam of rococo devices that became common on the continent and in England. Falciatore was one of these; Gaspare Traversi (active in Naples in 1749 and 1776) was another.

A second look at Falciatore's *Concert in a Garden* may be required to recognize a characteristic that distinguishes it as Neapolitan. On the surface it is one more example among hundreds, although an exceptionally attractive one, of the scenes of courtly dalliance initiated by Watteau's *fêtes galantes* a full generation earlier. Watteau's mood of gentle melancholy in gardens where delicate lads and fragile maidens, clad in taffetas, satins and plumes, are engaged in amorous

Museo di Capodimonte, Naples

The idea of furniture making of the period, as in elegant sofa, was to leave no surface undecorated.

byplay or recollection, shifted throughout Europe to range from prosaic to salacious. Falciatore, with his technical mastery, his delight in painting simply as a performance that the garden subject could give for both painter and observer, could have assembled the usual company of effigies in fancy dress and satisfied his patrons.

Instead, he gave a typically Neapolitan zest to the subject by individualizing the participants, transforming them from costumed dolls into a variety of social types responding to the concert in their own ways. The woman just behind the harpsichordist watches him with some curiosity but no apparent response to the music. (She might have been more interested if he were performing sleight-of-hand tricks.) In contrast, the abbot who sits with an elbow on the instrument is listening with rapt concentration, not even regarding the performer and oblivious to the young couple at his side who, engrossed in a flirtation, don't even

Sant'Agostino della Zecca, Naples

Giuseppe Picano's *Saint Joseph with the Christ Child,* of carved, painted, gilded wood, was done in 1771.

know any music is going on. In minor cameo roles echoing that of the woman in the arched window, a laborer in the far background carrying two heavy buckets takes in the scene without pausing in stride, and, at the far left, a roughly dressed kitchen servant passes a tray of refreshments to the elegantly liveried page who will serve them. Falciatore's English contemporary, William Hogarth, was using similar subjects to serve as social protest (which he found profitable on a ready market), but Falciatore, equally aware, surely, of the lamentable circumstances of the poor, chose to conscript them in the service of art alone.

Falciatore's rather sly, semisatirical but altogether good-natured observation of contemporary types, half concealed under the mask of genre, comes to the fore as the main theme of Traversi's *The Arts—Music* (p. 81), one of a pair (the other being *The Arts—Drawing*) celebrating their subjects without recourse to the kind of inflated symbolism that de Matteis punctured in his allegorical self-portrait. Traversi chooses a pretty young woman to serve as a domesticated Euterpe who gazes directly at us while the surrounding gentlemen respond to her, her music, or themselves in a variety of ways. The flutist (the only youthful member of the company of surrounding males) pays no attention to the score on the harpsichord, de-

riving his inspiration instead from his attractive muse. The cellist, well along toward old age and appropriately placed in shadows, is either looking with resigned nostalgia at the young woman, or across her shoulder at the score. It is difficult for us, and perhaps for him, to tell which.

The lively originality of Falciatore and Traversi tends to make the more conventional achievements of some leading painters of the Golden Age seem less inventive than they really are. Francesco de Mura's rococo sensibility in his late work transformed the heroics of his teacher, Solimena, into some of the loveliest images of his century. De Mura's *Allegory of the Arts* (opposite), in contrast with Traversi's *Music* and *Drawing*, assembles standard symbols of the arts and muses around a beauteous female figure who serves as muse for them all. In its rococo delicacy,

Self-portrait with Allegory of the Peace of Utrecht and of Rastatt, by de Matteis, may have been satirical.

The Sarah Campbell Blaffer Foundation, Houston

hybridized with and strengthened by classical discipline, de Mura's masterpiece represents the courtly aspects of Neapolitan style in the Golden Age at its elegant best.

The neglect—until this exhibition—of a body of art that offers such delights is not difficult to explain. This was not a period when art offered a truly heroic, often tragic, philosophical content of the kind that the baroque in Italy reached in its highest flights. Nor does it offer in Naples quite the exquisite sensibilities that marked rococo art in France—in spite of its frequent degeneration into precious affectation there. The primary explanation of the neglect, however, is that the 19th century found its major expression in forms of realism antithetical to rococo pleasures, and the 20th has been absorbed in the exploration of abstraction, too absorbed to grant the viability of pictorial genre and allegory or to see sculptures like Giuseppe Picano's *Saint Joseph with the Christ Child* (p. 79) as anything more than examples of craftsmanship that, for all their technical mastery, might have been executed more appropriately in tinted sugars. Actually, this particular sculpture follows a Neapolitan tradition of polychromed wood carving going back as far as the 15th century or farther, and by adapting that tradition to 18th-century taste Picano ties the Golden Age to a great past, not by reaction but by continuation. The very nature of any Golden Age is that it combines a summation of an already great past with expression of a climactic present. In this respect *Saint Joseph with the Christ Child* is a filial tribute to its ancestry and is, at the same time, a participant in current modes.

A question of design

In the case of furniture and other decorative arts that account for much of the impression of ebullience and sumptuousness in the exhibition, the neglect of Naples' Golden Age has amounted, until very recently, to downright rejection of the styles of design involved. Twentieth-century theories of functional design have reduced our esthetic appraisal of such elaborate objects as the gold-lined ewer and basin (p. 75), products of the Royal Porcelain Manufactory of Capodimonte founded by Charles Bourbon in 1743, to the level of expensive kitsch. But the last few years have seen a questioning of the principle by which the design of an object is admirable esthetically in direct ratio to its functional efficiency and nothing more, by which ornament becomes an imposed deformity. "The Golden Age of Naples" comes at a moment when critics have taken a second look at the functional ideal, which works very well in the design of, for instance, flatirons and spark plugs, but may become cold and monotonous in objects around the house that we see and use every day. The ewer and basin are no less usable for all their gold linings, arbitrary shapes and florid embellishments.

Nelson Gallery-Atkins Museum, Kansas City

In *The Arts—Music* Gaspare Traversi gives way to good-natured, direct observation of local types.

Musée du Louvre, Paris

Francesco de Mura took other approach, surrounded ideal muse with symbols in his *Allegory of the Arts.*

Naples attracted scores of foreign artists, some of them as famous as the German Anton Raphael Mengs, the Swiss-born English Angelica Kauffman and the French Elisabeth Vigée-Lebrun, all of whom had entrée to the court and painted portraits there. The star sitter for visiting artists, however, was available

to all comers—Vesuvius. English painter Joseph Wright of Derby, famous for his dramatic renditions of scenes in strong artificial light, was lucky enough, during a brief visit in 1774, to see Vesuvius, with its flaming cauldron, in eruption at night. (He evidently went right up to the edge.) Back home, he painted some 28 pictures from sketches made on the spot. Wright of Derby called Naples "one of the most wonderful parts of the world," an opinion shared by painters who saw the splendors of the court, others who knew the raucous, high-colored life of the streets, and those like Wright of Derby who were bowled over by the spectacular natural phenomena of the countryside and the bay.

One French artist, Pierre Jacques Volaire, came for a visit and stayed in Naples for 20 years. Of no great distinction otherwise, he established his own small enclave in the history of painting as Vesuvius'

Pierre Jacques Volaire came for a visit, stayed 20 years, painted *Eruption of Mount Vesuvius in 1771.*

biographer during those years, in pictures that went to collectors all over Europe. If a single painting summarizes Volaire at his best, it must be one of the eruption of 1771 (there were six eruptions during the 18th century) where he plays smoke, fire and a river of molten lava on one side of the picture against silvery moonlight and calm waters on the other.

Presumably Volaire's idea was to say something about the range of nature's moods from the hellish to the sublime, but Vesuvius' performance does not seem particularly terrifying. Rather, it is good theater. There is something wonderfully Neapolitan about the city's regard for its volcano. A potential menace in fact, Vesuvius takes on in spirit the nature of a protective deity. If it were to become extinct, Naples would mourn rather than feel relief. Vesuvius is Naples' Olympus, the permeating omnipresence in a living legend like none other.

The Art Institute of Chicago

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[2]Social Security was never *intended* to be more than a basic system supplemented by private pensions and individual savings. The price for forgetting this has been high and promises to get higher: combined employer/employee FICA taxes on our grandchildren's salaries could reach 25%. Of course, there are alternatives. Social Security could increase the official retirement age, pay benefits based on government-determined need, or simply *...reduce benefits in general!*

[3]Two-thirds of small businesses surveyed in 1978 offered no pension plans at all. One reason: Typically, big employers can write off 46¢ in taxes for every pension dollar they contribute, while most small ones can only write off about 20¢. In some cases, they can't write off anything.

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VAULT
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By Donald G. Schueler

Our family trees have roots in Utah's mountain vaults

The Mormon church gathers genealogical data so extensive that even a non-Mormon writer is able to trace his long-lost family ties

The "Leach Family Memorial Book," circa 1895, is part of the library's special collection.

An uninformed visitor might guess we are in one of the halls of the Mountain King—a recreation chamber, possibly, furnished with a shallow swimming pool for off-duty gnomes. But the reality is only a little less marvelous: this is the nethermost extremity of the Granite Mountain Records Vault, a man-made catacomb containing a trove perhaps more valuable than diamonds or gold. At least that is the view of members of the Church of Jesus Christ of Latter-day Saints, better known as the Mormons, who are collecting here copies of all the genealogical data on the human race before 1900 that the limits of time and budget permit.

This final tunnel dead-ends at a point 600 horizontal feet and 700 vertical feet inside a Utah mountain composed of a single chunk of igneous rock. My senses are just beginning to register these claustrophobic coordinates. Behind us, the vaults are sheathed in layers of galvanized steel and concrete grout; they look no more subterranean than a Quonset hut. But in this cul-de-sac, the unadulterated granite closes in, the drill holes for dynamite show plainly in gouged walls, the air reeks of stone.

Given the cryptlike atmosphere, the gnomes' swimming pool is a welcome grace note, even if it is actually a reservoir tapping underground springs at the mountain's core. "Our manna from heaven," says Herbert J. White II. "There's enough water in here to

More than a million rolls of filmed records are stored in drawers of granite-encased vault.

Color photographs by Hank deLespinasse

Mormons' massive record trove

Penetrating a single rock, tunnels lead to Granite Mountain Records Vault, the ultimate "root cellar."

Staff members appear Lilliputian as seen through the doorway of giant climate-controlled vault.

supply all our film-processing needs every day. And every night it fills right back up."

White is group manager of the Records Vault and the processing of microfilm is one of the most important operations he oversees. For religious reasons, the Mormon church—LDS as it is known in Utah—sponsors an ambitious effort to gather the world's existing genealogical information into the bowels of Granite Mountain, where it will remain safe throughout the ages. In the United States and 40 foreign countries including China, some 100 agents make arrangements with local archivists and government record keepers to film all sorts of vital statistics—birth, marriage, death certificates, censuses, church rolls, family histories. These flow to the mountain in an unending stream. As many as 65,000 hundred-foot reels of microfilm are being developed, filed or copied here at any given moment.

To handle such volume, Granite Mountain contains one of the most sophisticated microfilming operations in the nation. And since the place is usually off-limits to outsiders, Herb enjoys this rare chance to show it off. We have just been trooping through a series of chambers relatively close to the mountain's surface, roofed by a mere 200 feet of granite and lighted, here and there, by gridded sunlight shining through heavy portals that overlook a narrow mountain valley. All around us, accompanied by his baritone commentary, reams of microfilm whir and hum through the M-70 processors, Vesicular processors, Diazo processors, and—my favorite—the recovery processor, a Rube Goldberg contraption with bright

blue pipes that salvages silver crystals from the developing system. While we watch, the microfilm strips are spliced, developed, washed, "fixed," washed again, squeegeed, dried, cut, relentlessly scrutinized for clarity by intent young Mormons in blue smocks, then catalogued and rechecked some more. When this procedure is complete, positive prints survive for shipment to the Genealogical Library in downtown Salt Lake City, often to the donor who made the original records available, and to 360 LDS branch libraries.

But it is the deposition of the microfilm negative that earns the Records Vault its name. Deep within the mountain, three steel doors with a collective weight of 32 tons give access to six vaults, each large enough to accommodate a mature guardian dragon if there were any need for one. In them, genealogical films can be stored indefinitely at just the right temperature and humidity. The area is designed to withstand any act of God or Man this side of the millennium, nuclear holocausts included—a powerful bargaining point when LDS negotiators ask the world's record keepers to unlock their files.

I must admit that when Herb White first introduced me to these impervious vaults, I was less impressed than I should have been. Three of them were empty except for stacks of processing equipment. At the far end of a fourth was a lost-looking quartz-tube strain meter set up by geophysicists from the University of Utah. (The device is documenting strain changes caused by regional deformation of the Earth's crust.) But even the two vaults that did contain microfilm were not very exciting to look at, just long geometric processions of monotonous gray metal drawers (p. 86).

It was an unfair reaction, of course. What had I expected? Nevertheless, it was only after Herb had been called away for a few minutes that my attitude began to change. Left to myself, I reran the mind-boggling statistics that he had been reeling off. This time around, they began to sink in. Each of those thousands of drawers contained the microfilm equivalent of 100 to 200 large volumes. In the one-and-one-half rooms filled so far, there were more than 1.2 million rolls of microfilm. And on each of those rolls there may be thousands of names. (The collection is necessarily ecumenical since, from a Biblical perspective, Mormons and non-Mormons alike share a common ancestry. Equally important to the LDS is that future converts have access to their ancestral files.) Excepting Mormons and others who voluntarily submit more recent information, most of these names belonged to the dead since laws of privacy and LDS policy discourage the collection of records less than 90 or 100 years old.

What hit me *then* was the realization that most of these names belonged to people who weren't just dead; they were utterly forgotten. In most cases, in this world at least, everything that was personally theirs—their private histories, the rooms where they lived, the memory of them—had been erased after a generation or two. Everything except the names. The names, not "the enduring bone," were all that was

The author, a medievalist at the University of New Orleans, wrote of Colin Fletcher's quest for his *past in the February 1981* SMITHSONIAN.

Card catalog drawers marked "China" hold typical library data gleaned from 40 foreign countries.

left. In a not-too-fanciful sense, these vaults were a cemetery, more exactly a morgue, containing the last remains of perhaps two billion people.

This somewhat morbid perception was followed by another: it occurred to me that among the records—"mortal remains"—stored in those gun-gray cabinets were, very likely, those of my own mother. I should explain that on the maternal side, my family history is an almost total blank. My mother died when I was five years old. The only memory that I have of her is a mental film clip in which my father, presumably in a frolicsome mood, slips up behind her, grips her waist and lifts her up as she laughs and scolds.

My older siblings had provided more information. My mother and her three sisters had been orphaned, circa 1905. They had been variously assigned to the care of orphanages or my maternal grandmother's relatives. Later, when my father met and fell in love with my mother, her lack of "background" had inspired his conservative family to bitterly oppose the match. However, they became reconciled to my mother when she proved to be not only a goodly spouse but, in the parlance of the time, a "refined" lady as well. In our Brooklyn neighborhood—a comfortable place of brownstone stoops and shady avenues not yet scarred by crime and slovenliness—she was a much-admired matriarch. Yet my sister, who adored her, remembered the occasional bouts of melancholy during which she took long solitary walks.

My sister also remembered one bit of family history that my boyhood self found romantically appealing: our mother had mentioned more than once that her father, Edward Radford, was born into a Boston Brahmin family. But when he married my grandmother, a poor Irish girl named Minnie Dugan, he was disowned. My mother and her sisters were therefore the products of a love match. That, plus the early demise of their parents, had lent to all their lives a certain star-crossed glamour.

Concerning specific details, however, my mother had been reticent. When she died she apparently left behind very little data—names, dates, places—that might have shed light on her early life. My father had outlived her by only a few months. My guardians, drawn from his kindred, had considered her family background an uninviting subject and had discouraged the visits of her sisters, my aunts. Now all of that parental generation were dead and my sister as well. Within the family, only one document concerning my mother survived: her death certificate, in my brother's possession. It stated that Mae Radford Schueler had died in 1935 at the age of 46. The birthplaces of her father, Edward Radford, and her mother, Minnie Dugan, were listed, not very helpfully, as the United States and Ireland. The only promising clue was that my mother had been born in Brooklyn. Here, at least, was a specific locale. But when my brother contacted the public records office, he was told that laws of privacy applied even to the children of the deceased. My mother's history, like the tunnel behind the vaults, seemed to have reached a dead end.

Which brings us back to Granite Mountain. I had become keenly aware that the essential facts concerning my mother and her antecedents probably were buried in these vaults; and that if they were not recovered by me and my generation, almost certainly

Industriously pursuing their ancestors in books, on microfilm and microfiche (catalog in foreground),

they would be lost forever. Or at least until the millennium. With some excitement, I began to look forward to my next day at the Genealogical Library.

It is late afternoon when we say good-bye to amiable Herb White in the bunkerlike building that gives access to Granite Mountain and head down Little Cottonwood Canyon en route to Salt Lake City. I say "we" because, though Herb had been tour guide in the vault, it is Tom Daniels, public relations man for the Library, who will open his department's many doors. During the drive through Salt Lake valley, one-time breadbasket of Mormon pioneers, now the promised land of real estate developers, Tom tells me why Mormons consider genealogy to be so important: "We believe the family unit is designed by God to be eternal. For Mormons, especially for those married in Temple, the marriage ceremony 'seals' that couple and their children forever—predicated, of course, on the righteousness of individual family members." But the sealing—or eternal bonding—process, he explains, can also "work backward" in time. It is possible for the living family to seal themselves by "proxy ordinances for the dead" with as many of their ancestors as they can positively identify. Those ancestors now abide in a "spirit world." There, or after the Second Coming, they will have the opportunity to "accept the gospel of Jesus Christ" and in so doing be released from "spirit prison" and made eligible for "exaltation at the final judgment at the end of the millennium."

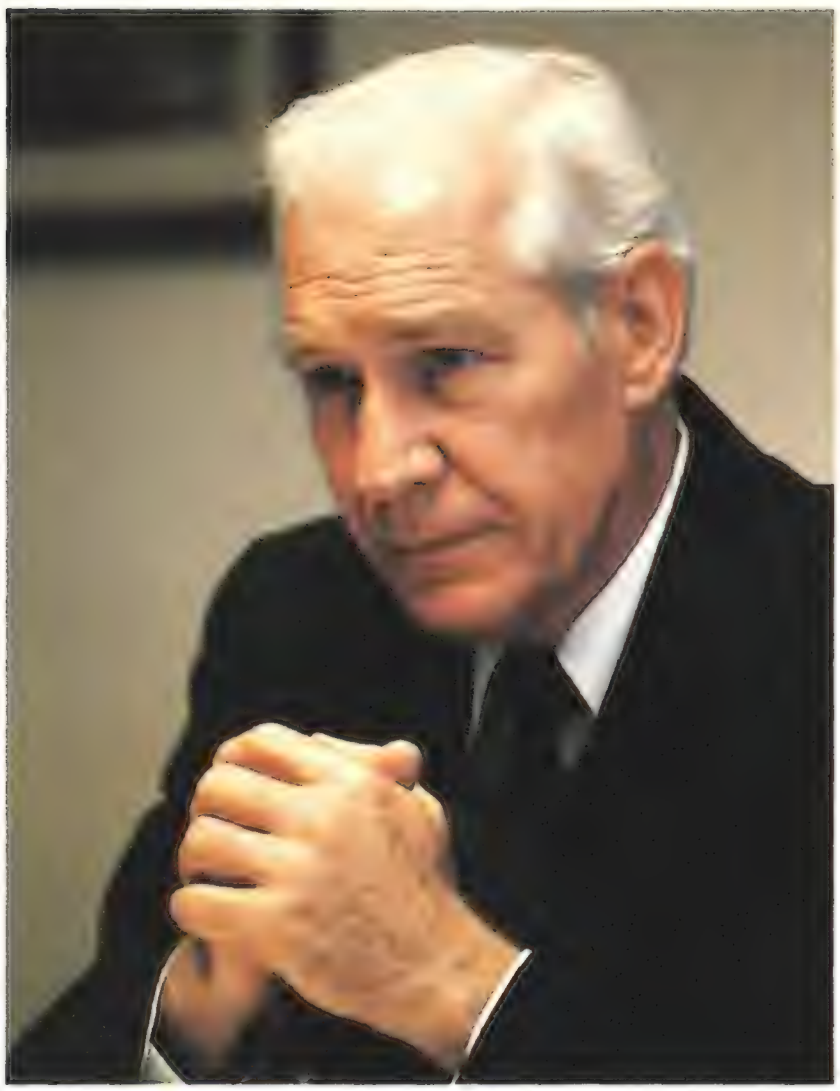
Whether one accepts that doctrine or not, the idea of an eternal family, incorporating the living and the dead, is a pretty one, especially appealing in an age when families have trouble sticking together until the kids are out of school, much less until death doth them part. My favorite expression of the concept comes from Royden G. Derrick, executive director of the Genealogical Department and a very high-ranking official in the Mormon hierarchy. Like other Elders of the Church, he had been called to his present "function" from a successful "life-venture," the presidency of a steel company which he founded. One of the first things he showed me was the bound volume of his family's "pedigree charts." Fondly, he pointed to the name of a great-great-grandfather. "We looked for him for years," he said, as though this particular ancestor had been mischievously truant. "Then, a while back, a girl from the office was going to England, so we arranged for her to do some research for the family. One day she was in Keynsham, looking through the records, when this total stranger asked her what she was doing. She told him, and right away he pointed to a dusty box in a corner—and there was the record of my third grandfather that she'd been searching for! So you see, it gets really exciting."

In Leach family's unusual "Memorial Book" (p. 87) are fastened hair samples as well as photographs.

some 3,000 Mormons and non-Mormons, like those below, daily crowd the library in Salt Lake City.

Elder Derrick had also written his own personal history for the benefit of his descendants. I asked him if there were a religious significance in doing that. "Oh, yes," he beamed, "my personal history will assist my children in turning their hearts to me. Just as when I sit down to do my fathers' history, my heart is turning toward them." It is the "heart's turning," a paraphrase from the last line of the Old Testament, that appeals to me.

The library is located in the west wing of the LDS office building on North Temple Street. It is a fairly new facility, a far cry from the wood-stove attic that



Royden G. Derrick, director of the Genealogical Department, finds family research "really exciting."

was the first home of the Genealogical Library when it was organized in 1894 by the then head of the Mormon church—Wilford Woodruff. Yet the library is already outgrowing the available space, and new quarters are being built a block away. All libraries should look so busy. About 3,000 ancestor hunters march through the doors on an average day. Two major catalysts account for the current boom. One is Alex Haley's *Roots*, which has inspired hordes of Americans—almost all of them, ironically, white—to start climbing their family trees. (Haley has said that had he known about the library when he was researching his book, he would have saved himself two years' work.) The other great incentive is a religious one. In recent years, the Mormon church has urged its members to try to search out at least four generations of their ancestry—and more, if possible—the idea being to build a computerized "ancestral file" of Mormon genealogies (as well as any others that non-Mormons care to submit).

There are how-to-do-it booklets and a large staff to help newcomers get started with their searches. But many tree climbers are old hands at the game. They know where to look for the relevant records, and how to use the 500 microfilm and microfiche readers. As Elder Derrick says, the search can get "really exciting." Patrons have been known to run down the aisles shouting "I've found him! I've found him!" And recently an overwrought lady kicked the shins of a worker who wouldn't surrender a book she needed.

About two-thirds of the library users are Mormons. There is, for example, Mrs. Barbara McGee, plumply middle aged, who has been tracing her genealogy on-and-off for 30 years. Like most Mormons I talk to, she admits her zeal is not purely religious. "It's a compelling spirit. You might leave it alone for a while, only it won't leave you alone. You don't only go into names and places. You start wondering why people moved from place to place. You do a lot of supposing."

Then there is Rick Royer of Ogden, a pleasant young fellow with an aw-shucks smile. "At this point," he says, "I'm doing it for fun." He is proud of one paternal grandfather who "went from ditch digger to vice president of Washington Water Power." And now he wants to find "who else in my background might inspire me to do a little better." Not everyone meets the bill. Royer has discovered, with a certain relish, that "some of these people were pretty rotten guys." But never mind; in their cautionary ways, they make useful models, too.

The non-Mormons are apt to come from anywhere. Helen Rietheimer is a genteel senior citizen ("My age is unavailable"), who has moved recently to Salt Lake City from Philadelphia. She is a dedicated professional who searches out other people's genealogies "when they've worn out their own efforts." She has traced her own line back to the sixth-century Saxon ruler, Cerdic, but she takes pains not to make much of that: "He was probably just another of those ignorant early kings." She flashes a confidential smile. "There's a certain amount of fun in all this, you know, but when you start being snobbish about it, well. . . ."

Actually, though, no one I meet in the library seems overly concerned about finding European blue bloods or American Brahmins roosting in their family trees. Consider Carl and Florence Backus, who introduced themselves as a retired couple from San Benito, Texas. According to a tradition in Mrs. Backus' family, her great-great-grandfather was the natural son of Meriwether Lewis and the Indian girl Sacajawea, who guided the Lewis and Clark expedition across the Rockies and to the West in the early 1800s. "We're not having too much luck proving it," she sighs. "The courthouses we needed in Arkansas and Missouri have burned down, so we're trying here."

Why, I ask, does it matter so much? "Curiosity," says Carl Backus. "We want to prove or disprove some family rumors. But it's history too, the kind you never learn in history books. Did *you* know that fathers used to place their sons in farms and factories when they were eight or ten years old? For economic reasons. The sons would work for ten years for nothing, then get a horse, a saddle and a suit."

Glenn Davis is in his mid-thirties, olive skinned, a native of Hawaii. His father's family has lived in the islands for at least five traceable generations, but his mother, dead now, was from the mainland. On leave from his job, Davis discovered the library by sheer chance while on a cross-country jaunt. That was a month ago. "I only meant to stay a couple of days," he grins, somewhat self-consciously. "After the first few days, I really started finding things. It makes you want to find more." Now, however, he is stuck. "I've gotten my mother's side back to the mid-19th century. I've got them out of the United States, but I don't know the names of the towns in Prussia and Canada. You got to know the towns." Well, then, I ask, will he finally give up? "Actually," he answers, "I do have one more lead. I figure a few more days." He pauses. "Actually, maybe a couple more weeks." I begin to suspect there is a streak of the gambler in Glenn Davis.

Professional genealogists like Helen Rietheimer help others leaf out branches of their family trees.

A coded index points the way

It is my turn now. Tom Daniels hands me over to bright, attractive Pat Godfrey, the member of the staff who will put me through my paces. Since I am on assignment, she and a couple of volunteer helpers have done some searching beforehand to see if there is anything to work with. But under Pat's guidance I follow the process from scratch. The point of departure is the U.S. Census of 1900, a vital document not only because it is so comprehensive but because, unlike most censuses, it has an index coded to names and localities. The code is great fun to work; after reducing my mother's maiden name to numbers, and with Brooklyn as the locale, I am eventually able to

Hawaiian Glenn Davis, in front of library building, found the facility by accident, stayed to trace kin.

find the microfilm containing the pertinent census sheet and lines. After cranking the microfilm reader for several suspenseful minutes, watching sheet after sheet of names swirl by, there, suddenly, is the one I am looking for. And *there they are*! My long-lost maternal grandparents and—more truly lost than I had ever realized—their long-lost family.

There are a couple of minor errors. Most notably, the oldest child is listed as Mary. Judging from the birth date, this has to be Mother, whose name was Mae. But the slip can easily be attributed to my grandmother's brogue or the census taker's inattention. Certainly there can be no doubt that I have the right record. There were not that many Radfords in New York state in 1900, and no others that married a Minnie Dugan from Ireland. The clincher is the last name on the list, Lottie—one of my mother's sisters—who was born just before the turn of the century. (The two younger sisters would have been born after the census was taken, so their names are not listed.)

It is the names that *are* listed that astonish me. According to the record sheet, my maternal grandparents had a total of nine children (seven by 1900), not four, and one of them, unnamed, already had died. But that still leaves me with three uncles and one aunt whose existences I had never suspected. They were, with my mother, the older children, born in the '80s and early '90s, so they would have been in their teens when my grandparents died early in this century. What had happened to those four? How had they become so scattered that even my mother apparently lost track of them? I remember Mr. Backus' comment about children being "placed" away from home for "economic reasons." For the first time, an awareness of the Dickensian dissolution of my mother's family comes home to me with considerable force.

If the census adds names to my family's history, it also takes something away. It is clear now that the romantic story of my grandfather's Bostonian connection is not true. He was born in Brooklyn and he was a blacksmith—a trade which even the disowned son of a posh family presumably would not take up. So. Someone had been lying, and it was certainly not my sister, who passed the tale along. Which leaves my mother as the likely suspect. According to the census, she would have been in her late teens when her parents died, and surely would have known the truth about their origins.

Of course I am "supposing," as Mrs. McGee would say. But the supposition of that lie affects me powerfully. Not as a lie, of course, but as a dismayingly tender perception of the sort of person my mother was. Poor lady! No wonder she was the neighborhood matriarch, having been born the oldest daughter in a large and impoverished family. And how hard she must have worked at being "refined"—enough so to catch and hold my father's eye against the wishes of his family. How insecure that family must have made her feel. And how natural that in the unshared loneliness of her long walks, she would have dreamed up a wishful fib about her father's background, relaying it to her husband and daughter and, when they were reunited, to her much younger sisters, who wouldn't have remembered their parents any more than I remember mine.

More than anything else, it is the "supposing" of this small poignant lie that now prompts my "heart's turning" not only toward that long-dead woman, but toward all the others, her brothers and sisters lost and found, and the indigent blacksmith and his immigrant wife whose "life-venture" ended so haplessly. Now indeed I begin to understand what everyone has been telling me about the attraction of reconstructing the past. Only I am not so sure the game is altogether fun.

Pat Godfrey, hovering near, suggests that since I have gone this far, the immense resources of the library may provide other clues to my mother's history—my history—if and when I wish to follow them up. Shall I? I honestly don't know. Without the religious impetus, perhaps I have already learned as much as I want to learn. More, really, than I had bargained for.

Still, I remember Mrs. McGee's observation about the search for roots: "You might leave it alone for a while, only it won't leave you alone."

Under tutelage of library's Pat Godfrey (left), author Schueler practices using microfiche reader.

Mae Radford Schueler was enigmatic subject of her son's bittersweetly successful research.

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Model of Dinosaur Hall, above, shows fossil deposits, skeletons and time column; John Gurche, at right, works in acrylic on final panels for mural.

A remarkable tower of time tells the story of evolution

Inch by inch, the new 27-foot-tall mural at the National Museum of Natural History takes measure of the development of life

At the bottom is a clump of single cells and at the top, Man. In between are 700 million years of life. This 27-foot, monolithic mural depicting the story of evolution stands in the new Dinosaur Hall which will open this month at the National Museum of Natural History—and is the basis of a nine-page fold-out section beginning on the next page.

The mural is the work of John Gurche, who went through his own 16-month evolutionary process to create it, from scribbles to sketches to paintings. Educated in geology and anthropology, the 29-year-old artist considers his science background an asset. "I know what lived when," he says. "I could work out the design without bothering the experts every day." His drawings are based on scientific evidence, although many of the colors are "guesswork." The only hypothetical creature is the "leaping link" between the reptile and the first bird, *Archaeopteryx*.

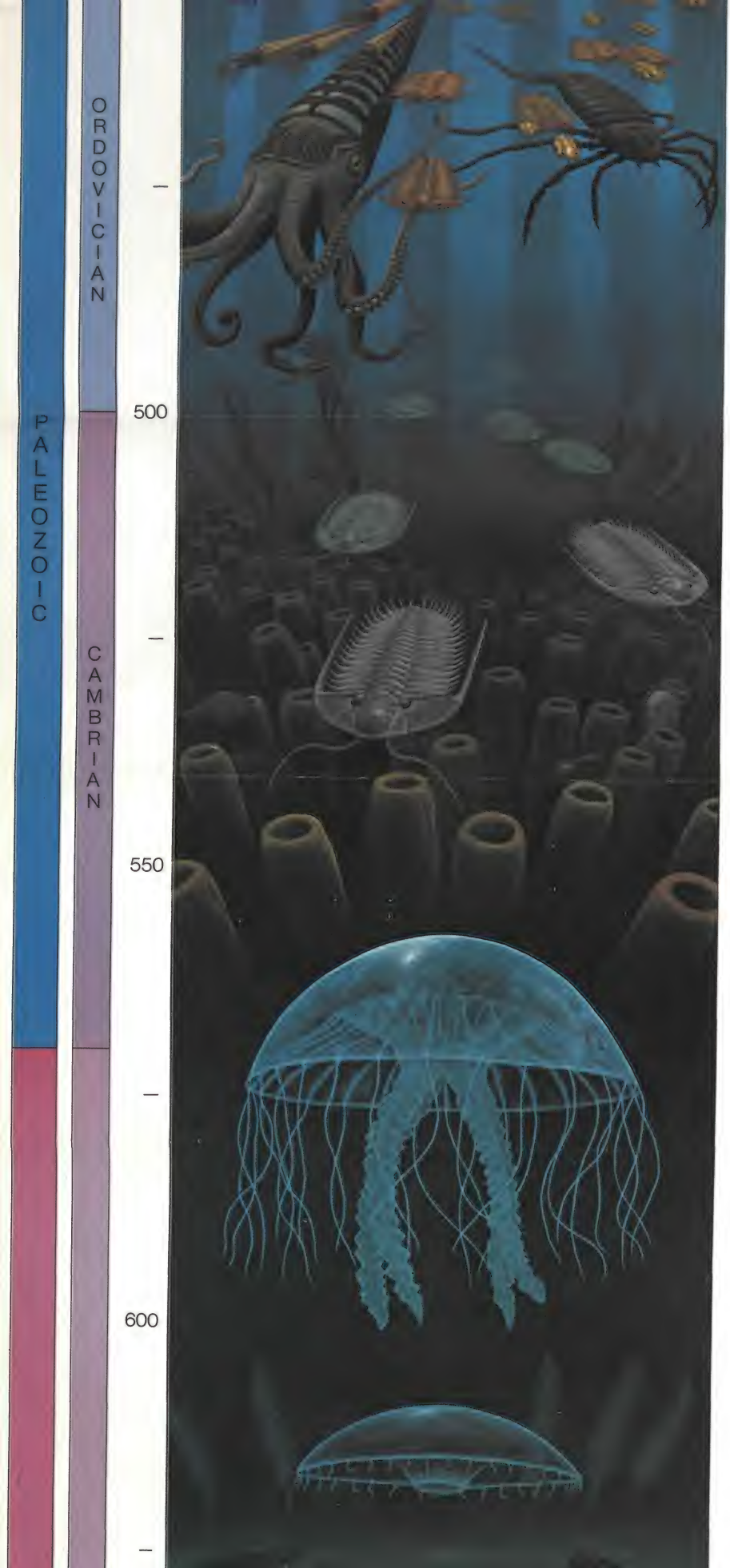
The time column shows evolutionary highlights at the approximate times and within the periods they occurred. By radiometrically dating rocks and the fossils within, scientists can determine these times. The column extends past the zero point—today—so that modern Man, a mere 40,000 years old, could be painted large enough to be seen.

To view the column from bottom to top, turn the page and turn the magazine counterclockwise.

Life began in the sea about 3.5 billion years ago. The glowing sphere represents a crucial step in the development of life on our planet—the point at which single-celled organisms began to coalesce into more complex, multicellular life-forms. For the preceding three billion years—equaling four more of these time columns—all life was single-celled.

A 700-million-year span of life on Earth from single cells to modern Man

↑ OVER



Marine invertebrates increased dramatically in abundance and diversity. The trilobites, the cone-shaped, tentacled cephalopods, and the eight-legged sea scorpion seen here eventually became extinct. But they have living relatives today, among them the octopus, squid and horseshoe crab.

Here trilobites with jointed legs and compound eyes cruise above sponge colony. Within the colony live a wormlike onychophoran (left), a pair of shelled brachiopods, a snail and a trilobitomorph.

↑ FOLD OUT

Further adaptation to the undersea environment resulted in the evolution of hard body parts such as shells and skeletons. The hard parts of such creatures as the tubelike sponges shown here fossilized more readily than the impressions or tracks of soft-bodied creatures, and help form the basis for the study of evolution today.

Sea pens, jellyfish and wormlike creatures such as *Dickinsonia* (under smaller jellyfish) and *Spriggina* were among the earliest multicellular organisms for which fossil evidence exists. Impressions of these and other soft-bodied animals were discovered in the Ediacara Sandstones of southern Australia. They constitute the oldest animal community on record.

PALEOZOIC

CARBONIFEROUS

DEVONIAN

SILURIAN

ORDOVICIAN

350

400

450

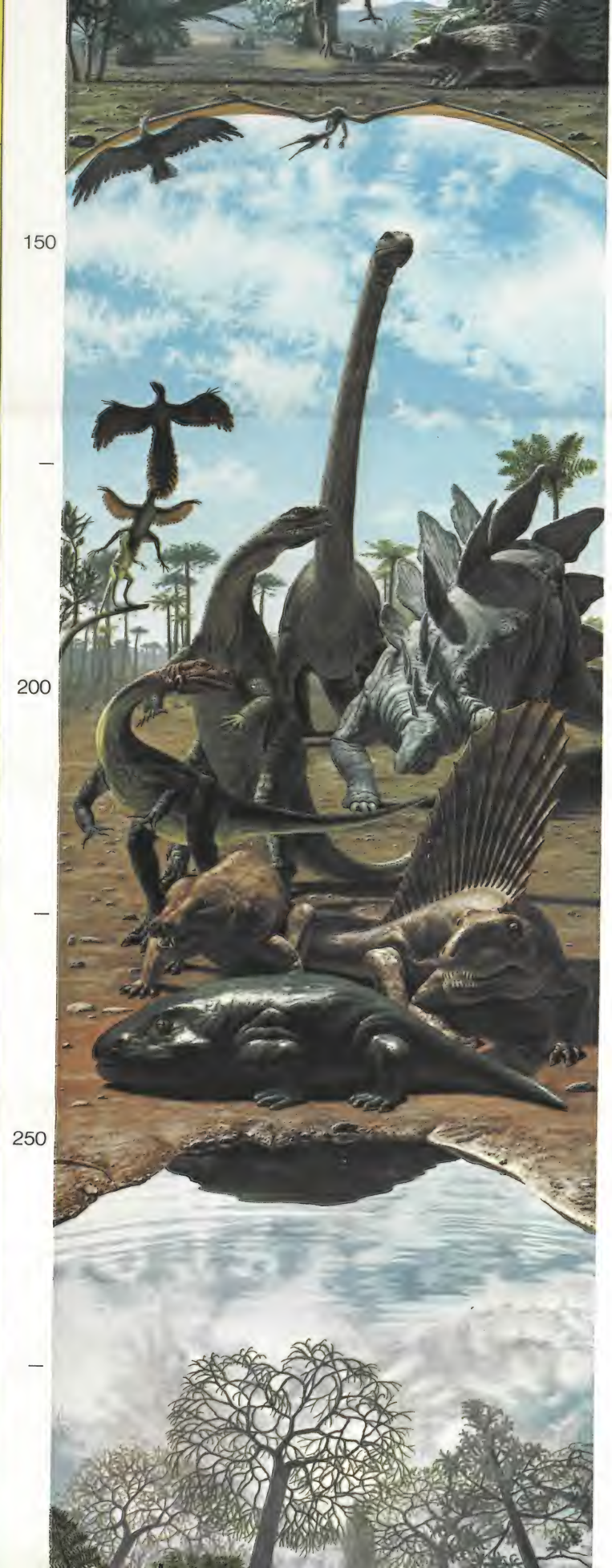
Reptiles, the first vertebrates to be independent of water, represented a great breakthrough in evolution. Their scaly hides prevented desiccation and their hard-shelled eggs encased a miniature liquid environment. Unlike amphibian eggs, reptilian eggs did not have to be deposited in water. Reptiles, like *Paleothyris* shown on tree stump, now could exploit the rich variety of habitats on land. The cockroach near reptile's tail was a very early insect.

About 370 million years ago vertebrates, too, began to haul themselves out of the water. *Eusthenopteron* was a lobe-finned fish that could "walk" from pool to pool. *Ichthyostega*, shown with its eyes out of water, was among the first amphibians, a new group of vertebrates that was at home both on land and in water; seen crawling in from right is *Megalocephalus*. Amphibians ruled the land for about 100 million years; today they are represented almost entirely by frogs, toads and salamanders.

While the sea teemed with life, the land was still barren. The first sign of change was a greenness at the water's edge as minute, leafless plants gradually emerged from the sea and began to colonize the coastlines. With the establishment of plant life, invertebrates began to invade the land. Scorpion, shown creeping out from beneath plant, was one of the earliest pioneers.

Fish were the first true vertebrates—animals with a backbone. The earliest fish were jawless, such as the pair under the *Pterygotus* (below), but they were supplanted eventually by predaceous forms such as the giant armored *Dinichthyes*, mouth agape. *Climatius*, shown in a small school, was a swift and agile predator because of its improved fins and loss of armor.

One of the most ferocious predators of this time was the ten-foot eurypterid *Pterygotus*, which was armed with huge claws. Other invertebrates in this group are horn coral, fingerlike bryozoans, more brachiopods and trilobites, and a large snail.

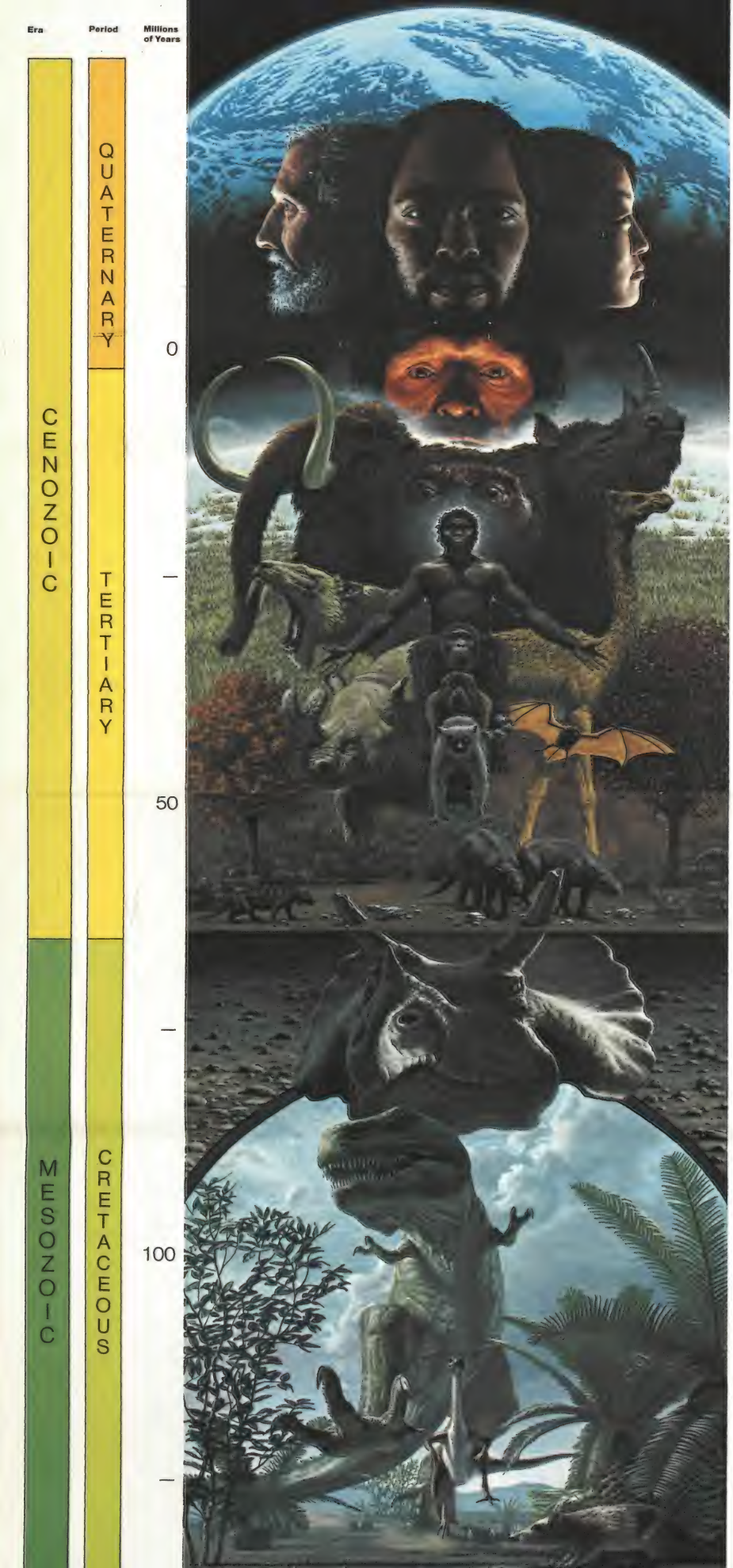


Distinct from the birds were the pterosaurs. The largest of these flying reptiles was *Quetzalcoatlus*, with a wingspan of 40 feet. Flying beneath it here is *Ichthyornis*, a primitive bird that had teeth.

Reptiles were the progenitors of birds. The evolutionary sequence at far left culminates in *Archaeopteryx*, the first true bird. It combined reptilian features such as teeth and foreclaws with a uniquely avian feature, the feather. In addition to its superb qualities as an insulator, the feather is an unparalleled aerodynamic success.

Eryops, shown just above pool, was a giant amphibian. Behind *Eryops*, two mammal-like reptiles, *Cynognathus* (left) and *Dimetrodon* (right), represent branch of reptiles that gave rise to mammals. Animals such as these died out as dinosaurs came to dominate the land. The largest land animals in history, dinosaurs were diverse and abundant for some 140 million years. Representing them are, from left, *Coelophysis*, *Plateosaurus*, the long-necked *Diplodocus* and *Stegosaurus*.

Lush tree ferns and the spreading crowns of *Lepidodendron*, the scale tree, symbolize the first great forests. The approximately 300-million-year-old remains of this rich deposit of vegetation have formed some of the most valuable coalfields of today.



At the top of the tower are three faces representing modern Man, who has existed fewer than 40,000 years. If drawn to scale on the time column, the faces would be only a fraction of an inch high.

The evolution of higher primates, including Man, was marked by the development of binocular vision, grasping hands and enlarged brains. Above the early primate *Notharctus* (on all fours), are *Aegyptopithecus*, *Dryopithecus* and *Australopithecus*, whose eyes, in closeup view, testify to his incipient humanity. Overlooking fellow Ice Age inhabitants, the mammoth and woolly rhino, is Neanderthal Man, his face lit by firelight.

Mammals evolved from reptiles. They produced milk and bore living young which they fed and protected. Because mammals had insulating hair and were warm-blooded, they could be active in a variety of climatic conditions, a great advantage over their cold-blooded ancestors. Shown roaming among fossil fragments are primitive mammals, *Oxyaena* (left) and *Barylambda* (right). Later mammals were *Brontotherium* and saber-toothed tiger (left of primates), bats and camels. Modern trees appeared, including maples and oaks; the emerging grasslands allowed herds to prosper.

Dinosaurs continued to flourish. Here, amid the early flowering plants, *Tyannosaurus rex*, the largest terrestrial flesh eater, stalks its smaller cousin, *Struthiomimus*. At lower right lurks an early mammal. The horns of one of the last dinosaurs to become extinct, *Triceratops*, protrude into the next era, which was soon dominated by mammals.

New Dinosaur Hall brings back to life the age of reptiles

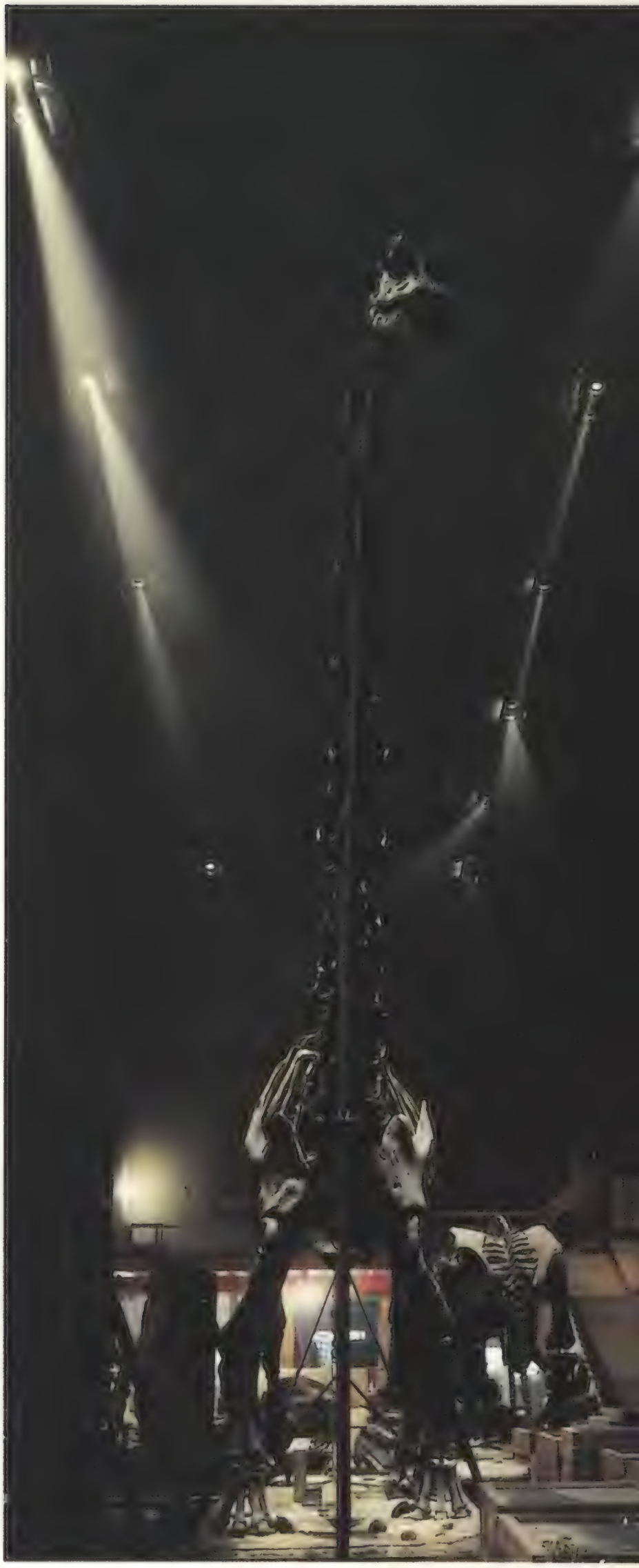
The mighty skeleton at right has stood in the Museum of Natural History for half a century. It's a dinosaur of the type called sauropods. Its full title is *Diplodocus longus*, a good name for a reptile that stretches about 90 feet from nose to tail and towers some four yards above the schoolchildren who, generation after generation, have peered up at it.

Diplodocus recently has been moved back about 30 feet and gently turned, for its gallery, commonly called the Dinosaur Hall, has been reorganized and refurbished as part of an extensive museum project called "Fossils: The History of Life." The new Dinosaur Hall opens this month. Other rooms or parts of halls already have opened in accordance with this theme. More are on the way.

The hall concentrates primarily on dinosaurs and attempts to answer such questions as: What is a dinosaur? What did they eat? How did they get so big? When and why did they vanish from the Earth? Other features of the hall include the time column reproduced on the preceding pages, and exhibits on the origin of vertebrates (animals with backbones), the fossil history of flight, living fossils, and fossils as natural resources.

An impressive early vertebrate recently restored for the new fossil exhibit appears near the entrance to the hall—and on page 114. The display shows the massive skull and trunk of a giant armored fish, *Dinichthyes*, that lived more than 300 million years ago and was the largest predator of its time.

Dr. Nicholas Hotton, one of the project's scientists, thinks *Dinichthyes* was about twice as long as what is seen in the hall—perhaps in all, eight feet from sharpened jaws to tail. He believes it was a sedentary hunter, sitting still near the bottom and waiting for its prey to swim close. "Its size and weight indicate this possibility," says Dr. Hotton. "Also its shape. The fish was



Diplodocus longus, 90 feet long, dominates the hall, looming above the skeletons of smaller dinosaurs.

Photographs by Roy E. Clark

New Dinosaur Hall opens

Dr. Jessica Harrison works with a miniature of the pterosaur that now hangs from the ceiling.

arched on top and flat underneath. And the head shield and shoulder shield are hinged. This would allow it to cock its head back like a snapping turtle, and when something swam into its mouth to investigate the territory, *chomp!*"

Hotton points out that most restorations of *Dinichthyes* show it swimming violently after some smaller fish. "They make it act like 'Jaws'," he says. "That's ridiculous!"

He speculates that the monster may have lured its prey the way the alligator snapping turtle of the lower Mississippi does—by wiggling something alluring inside its mouth—in the turtle it's part of the tongue. Fish dart after the lure and that's the end of them.

Armored fish, or placoderms, are the only vertebrate class which has become extinct. There is some conjecture that remnants of the class can still be found. Dr. Hotton, however, feels that's most unlikely.

The dinosaurs lived much later. Huge *Diplodocus* was the longest of all, but surprisingly light (about 11 tons) in weight. Other skeletons represent *Dimetrodon grandis*, a mighty predator with vicious-looking teeth, and the herbivorous *Edaphosaurus*; both these animals had dorsal fins that they could turn broadside to the sun and so maintain body heat—a biological solar device.

No money on the model

There are skeletons of other specialized dinosaurs: fierce *Antrodemus*, the plated *Stegosaurus*, the horned *Triceratops*. The papier-mâché model of *Stegosaurus* was built in 1903. Word got around that the paper used was actually old money, taken out of circulation and shredded by the Treasury Department. "Old Moneybags," people called it. But when it was being refurbished for this exhibit, experts from the Treasury Department came and had a look. No money. A nice piece of Smithsonian mythology down the drain.

Diplodocus was found in Utah in 1923 at what was to become Dinosaur National Monument. It took seven years to mount the skeleton in the museum. Beside it sprawls a somewhat smaller dinosaur in the position in which it was found. The skeleton appears to be half-buried in sandy soil, the neck bent toward the body in death.

Lest any visitor consider the paleontologist's task too easy (given a neatly arranged skeleton like this), the exhibit includes a "Dinosaur Kit—Assembly is Required." Here a display of *Stegosaurus* in a death pose shows that often only a few bones of a skeleton become fossils, so there may be several parts missing, and there's no instruction sheet. The bones must be cleaned and protected for shipping, then put together. For an exhibit, missing pieces must be fabricated. The

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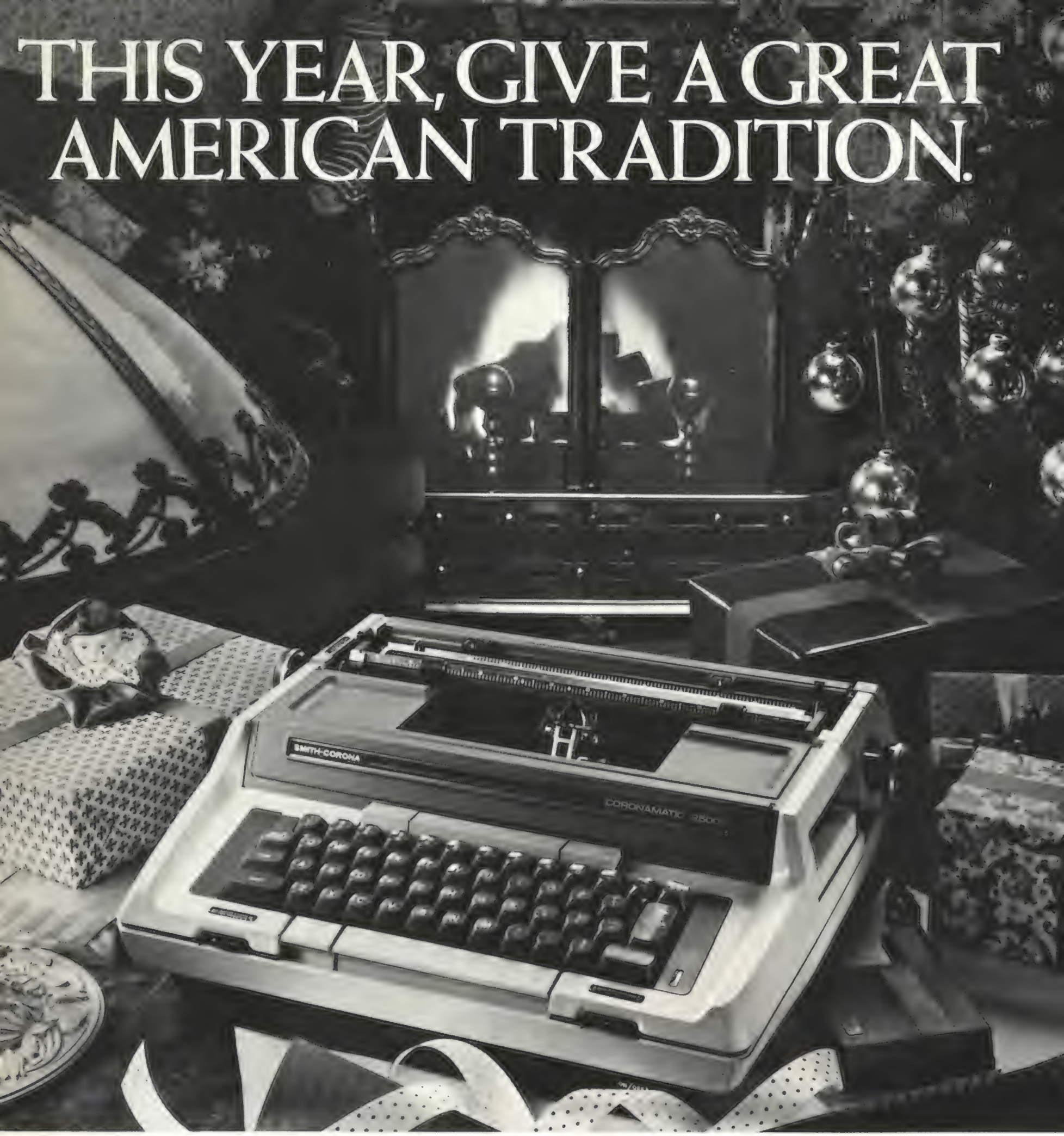

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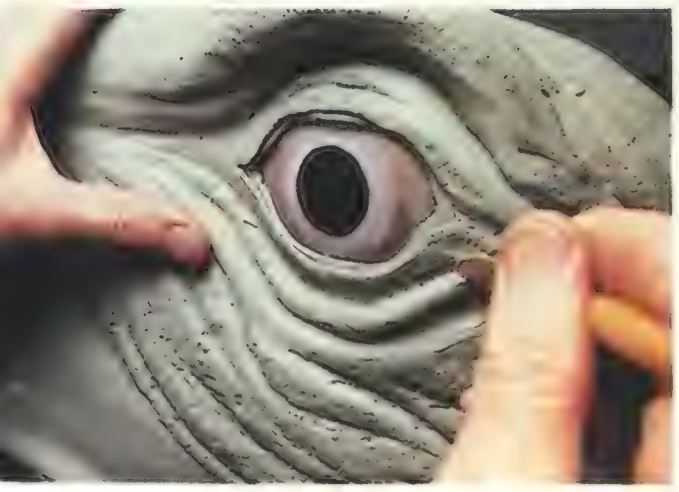
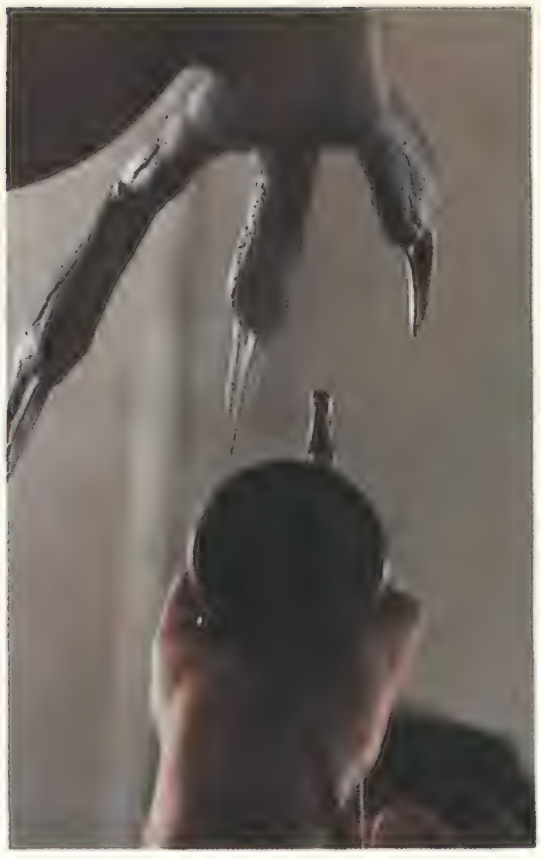


The pterosaur's eyelid is modeled in clay.



Coat of paint is airbrushed onto the foreclaws.

Model maker Jim Reuter applies molding compound to head of the pterosaur.

mechanics of putting together an accurate reproduction of a creature which has been extinct for millions of years requires a blend of careful science and meticulous craftsmanship.

An extraordinary example of the reconstruction of an extinct animal hangs above the dinosaurs. This is *Quetzalcoatlus northropi,* a giant pterosaur or flying reptile. With a 40-foot wingspan, it's the largest flying animal in history. The name has interesting derivatives. *Quetzalcoatlus* refers to the winged serpent, Quetzalcoatl, which goes back to the days of the Toltecs. In contrast, the *northropi* is a reference to the Northrup Flying Wing, an experimental plane.

The pterosaur (one must avoid calling it "Big Bird," because it's not) gave relatively few clues to its restorers. A great deal of the skeleton was missing. But Dr. Jessica Harrison, the vertebrate paleontologist working on this hall, dug up what facts she could, sorted them all out and, in her words, "used a bit of educated guesswork" to put the animal together. She used plenty of common sense, too.

The pterosaur would have stood erect, wings folded. Its legs were (are, in the reproduction) long and slender and strong. Bones were ultralight, much more hollow than a bird's. It probably ran a few steps, then jumped into the air for takeoff. It could have stroked its wings quite powerfully for a spell, but probably it soared more than it flapped. Fossilized stomach contents showed fish in earlier pterodactyls—hence it seemed reasonable that that's what it ate. A fossil from the Soviet Union indicated that the body was covered with fur. Also, there were fiber bundles in the wings that strengthened them, indicating that they could handle the weight of the body. The bundles can be seen as small, uneven ridges running lengthwise along the underside of the large wings.

Dr. Harrison worked with colleagues at the Smithsonian Model Shop, Walter Sorrell and his aides, to reconstruct a creature that fulfilled these qualifications. "I wanted to avoid the drab greens and grays you so often see in depictions of fossil reptiles. So we settled on this brown and buff countershading, darker tones above and lighter tones below—as is commonly the case in flying mammals," Harrison says. The fur is synthetic, first glued and then sewn in such a way as to give it a natural nap.

Sorrell and his team made the animal using a metal frame covered with wood and fiber glass. The head

Bone structure can be seen clearly in topside view of pterosaur; fur coat is yet to come.

was first modeled in clay and then cast in fiber glass. Wings were formed by using slats to get the right curves and foils. All pterosaurs spread the length of their wings along their fourth "finger." The thumb and the next two fingers jut from the angle of the wing. The little finger has been lost. The upper arm bone, or humerus, is very short and thick. The radius and ulna are small, linking the inner wing to the muscular body.

And there the great creature soars above the new Dinosaur Hall. It's shown in a gently diving turn, head atilt as it scouts for food, long neck curved, legs stretched behind, rump raised slightly, the wing tissue seeming to flex as the air rushes past it. It looks as though it would fly with grace and beauty.
Edwards Park

Being prepared by Leroy Glenn for its place in the new hall is huge armored fish, *Dinichthyes.*

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LTV. Looking Ahead

Does U.S. industry need trade protection? "Realistically, yes..." says Kirkland. "Counterproductive," argues Crandall.

U.S. NEEDS PROTECTION

Lane Kirkland
President, AFL-CIO

"...the cry of protectionism is never raised against protectionist governments; only against U.S. exporters who complain."

As American-flag ships vanished from the seas after World War II, seamen were told this was, after all, a manufacturing nation, not a service nation. Export, not transport, was where the jobs were.

After 30 years of export deficits, it is said the U.S. should emphasize service in its trade policy. The loss of steel plants in Pennsylvania, auto plants in New Jersey, railroad parts in California, shoes and machinery plants in Missouri and electronics, glass, rubber and aluminum nationwide are acceptable because this is a service economy.

Economic diversification only answer

In the eyes of the AFL-CIO, neither of these simple arguments holds water. The United States must be a diversified manufacturing, agricultural and service economy, with a complete range of basic industrial and technological products. Anything less fails to develop the resources and industries this nation needs to provide full employment and rising living standards. That is the goal. Trade policy is one means of pursuing that goal, not an end in itself.

Those who speak of "free trade" as if such a thing still existed talk as if the United States has many barriers to trade and other countries very few. The reverse is true. Other nations have planned economies, import restrictions, export requirements and export subsidies.

No U.S. exporter has free access to the markets in Japan or Brazil, let alone such countries as Romania or the Soviet Union. And yet, the cry of "protectionism" is never raised against protectionist governments; only against U.S. exporters who complain.

These are increasingly in short supply. It is easier to close U.S. plants, open new ones abroad, enjoy protection within these markets and export freely to the United States and third markets. Industry gets every encouragement to do so from U.S. policymakers, who deny help to American producers in the U.S. while deploying an array of subsidies for overseas investments.

Changing the balance

U.S. tax and trade policies have led to a world in which the principal traders are now multinational banks, corporations and governments, often working in partnership, destroying the industrial fabric of the United States while charging the U.S. with "protectionism." As long as this imbalance remains, the losses from foreign trade will be much higher than the gains for most Americans.

What America needs is a fair trade policy that takes account of the real world, in which free trade does not exist.

No country need apologize for giving weight to its own national interest; for the United States to ignore its people's needs is suicidal in the long run.

LOOK BEYOND POLITICS

Robert W. Crandall
Senior Fellow
The Brookings Institution

"...the arguments for trade protection ignore some rather fundamental political and economic forces which severely limit their validity."

Any period of economic adversity creates political pressures for "temporary" protection of domestic industries from import competition. Both labor and management argue that trade restrictions will allow industry to modernize, to reduce unemployment, and to be relieved from "unfair" foreign competition and its effect upon prices. The political appeal of these arguments is obvious. One needs only to look at the protection the U.S. government has given producers of textiles, shoes, clothing, meat, sugar, television sets, steel, and even automobiles.

Unfortunately, arguments for trade protection ignore fundamental political and economic forces which severely limit their validity. First, protection is usually counterproductive. Relieved of foreign competitive pressures, domestic producers are likely to adjust more slowly to economic circumstances. The steel industry has benefited from protection for all but four of the past twelve years. No one can seriously argue that this "temporary" respite has induced the industry to accelerate its modernization program.

Altering collective bargaining

Secondly, it weakens the resolve of management at the collective bargaining table. The most noticeable effect in the steel industry has been the sharp acceleration in its wage rate which began precisely when the first restrictions on steel imports were being negotiated. Now the industry pays $20 per hour for its labor and finds it difficult to compete with the Japanese and Koreans (or even the Canadians).

Perhaps the most disquieting result of trade protection is its permanency. Government cannot know whether it is easing

an industry's temporary problems or creating a permanent ward of the state.

Removing all import restrictions on textiles or apparel is now unthinkable. We should not succumb to pressures for creating similar government wards out of our automobile or steel industries, even if other countries choose to subsidize their failing industries. American workers and consumers are not helped by a policy of sheltering businesses which are no longer competitive.

Finally, we must consider the effect of retaliation by foreign governments on our exporters. Trade protection for our dying and weak industries will reduce the demand for exports from our high-technology and farming sectors as foreign governments are forced to retaliate. We only need to look back on the 1930's to see how such trade policies can convert a recession into a depression. Surely, no one is well served by a trade war.

This is Mr. Crandall's opinion and not that of other staff members or trustees of The Brookings Institution.

WHAT THE PEOPLE THINK

Reported by
Kenneth Schwartz
Vice President, Opinion
Research Corporation

"...people believe that American companies are falling behind..."

How the American public feels about the very sensitive issue of foreign competition is an issue which is not only crucial to the nation's economy, and the LTV Corporation, it is a concern in almost every household.

To gain a better understanding of the depth of these feelings, Opinion Research Corporation conducted a nationwide telephone survey in March of 1,008 people. They were asked, "To begin with—from all that you have heard or read, would you say that American companies are holding their own or falling behind in competition with foreign companies?"

Six in ten Americans believe that U.S. companies *are* falling behind, while 29% think they are holding their own. The other 11% had no opinion.

More importantly, the proportion of people believing American industries are falling behind rises significantly as income rises.

Believe American companies are falling behind in competition with foreign companies	
Under $10,000 family income	50%
$10,000-$14,999	57%
$15,000-$24,000	65%
$25,000-$49,999	68%
$50,000 or more	73%

We next asked if they would favor restrictions on imports. Four in ten of those who see American companies falling behind our foreign competition believe we should have restrictions on some imports. One in five would favor restrictions on all imports.

Percentage of Americans favoring restrictions on imported goods	
Restrictions on all imports	23%
Restrictions on some imports	40%
No restrictions	32%
No opinion	5%

Of those favoring restrictions, the overwhelming majority favor restrictions on automobiles—75%. Other restrictions on goods and services were not so widely mentioned.

In sum, Americans are keenly aware of foreign competition and concerned about its impact on the U.S. economy. They also know that U.S. trade policies will have to change.

WHAT LTV BELIEVES

Speaking for LTV
Paul Thayer
Chairman of the Board and
Chief Executive Officer

"...for the future of American industry to be successful, America must be able to compete equitably."

Open competition is an American legacy. Our nation's industrial success has been built upon that legacy. But, when the world's producer nations each play by a different set of rules, competition alone isn't enough.

American tax and consumer dollars helped make foreign competition as formidable as it is today. We accept that as a fact of business life. What we cannot accept are practices such as the dumping of government-subsidized, foreign-made steel into the U.S. market—steel sold at below the cost of the most efficient producer. In other words, when unfair trade practices are pursued, we believe our government must exercise a restraining hand. In the long run, carefully measured intercession will bolster rather than deter competition.

American business, on its own, must continue to produce more efficiently if it is to succeed in the world marketplace. LTV has recently embarked upon a $400 million capital expenditure program to modernize many of the steelmaking facilities of its steel subsidiary, Jones & Laughlin, the nation's third largest steel producer. This should strongly enhance J&L's ability to compete. Additionally, J&L has benefited significantly from a remarkably effective productivity improvement program.

1981 will be an important year for LTV's Jones & Laughlin steel group and our Continental Emsco energy products and services group. Strong demand for products—drilling equipment/supplies and tubular products—will have a positive impact on our revenues.

J&L is the nation's largest supplier of pipe to the oil and gas industry. Concurrently, new orders for Continental Emsco's drilling equipment are running far ahead of last year. In both cases, as the number of active drilling rigs and pipelines under construction continues to reach record levels, our activities in both areas will also increase.

LTV is dedicated to becoming increasingly competitive in the areas in which it operates—and to the principle of open competition. But for the future of American industry to be successful, America must be able to compete *equitably*. This will require more than hard work and capital investment. It will require U.S. and international trade policies that truly recognize the world marketplace as it exists today, and provide protection and fair play for *all* the participants. The end result will be a more balanced industrial environment. And that will benefit the *consumer* as well as industry.

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Imperial Household Agency, Tokyo

Peppered by arrows, Mongol warships loom off fortified coastline of Kyushu's Hakata Bay.

By John Saar

Japanese divers discover wreckage of Mongol fleet

Khubilai Khan's formidable armada threatened Japan twice in the 13th century but was sunk by the "divine wind"; now, salvage work begins

For centuries the fishermen of Takashima, an islet nestled against the northern coast of the large Japanese island of Kyushu, have been finding strange objects tangled in their nets. Along with fish, they often harvested shards of ceramic dishes, ancient kitchen utensils and barnacle-encrusted sword blades.

The relics all dated back to the 13th century and the people of Takashima knew from word-of-mouth handed down through the generations about how they had come to be buried in the seabed under 90 feet of water: as remnants from the rotting hulks of Mongolian conqueror Khubilai Khan's second invasion fleet—launched against Japan in 1281—that lay close to their shores. Last summer an underwater archaeological expedition confirmed the Takashima legend. Using sonar scanners, investigators located 72 mud-covered clusters of objects—remains from a colossal armada of 4,500 ships. The invasion failed because a typhoon scattered Khubilai Khan's fleet. Believing Providence had intervened to protect their sacred soil, the Japanese called the storm "kamikaze," meaning the "divine wind."

Off Takashima Island, where Mongol ships sank,
Professor Torao Mozai surfaces above wrecks.

National Palace Museum, Taiwan

Khubilai Khan, emperor of China from 1260 to 1294, dreamed of conquering Japan till the end of his life.

The summer discoveries make the seabed off Takashima one of the world's most exciting underwater archaeology sites. Preliminary diving in just two of the areas yielded an "enormous quantity of artifacts," reported expedition leader Dr. Torao Mozai of Tokai University: "There is now no doubt that we found the remains of Khubilai Khan's fleet. We must now salvage as much as we can before it is lost forever."

The divers surfaced with sword blades, vases, stone anchors, ingots of iron ballast, jugs for mixing gunpowder, and catapult balls bearing traces of oil and the combustible cloth they were wrapped in (p. 125). The richness of the site forced Mozai's divers to leave many other objects for later recovery. "We found so many things down there," he relates, "but we didn't want to sacrifice any of them in our haste."

The sea played a crucial role in the disastrous fate that overtook Khubilai Khan's armada 700 years ago. Yet after the furious storm had destroyed these ships within a few hours' time, they had lain undisturbed for centuries. Entombed and preserved in sand and mud, the wreckage is a time capsule that will add a fascinating modern postscript to the events of 1281.

The author, a free-lance writer, was an Asian correspondent for the Washington Post *and* Life.

The sea alone had seemed able to curb the ferocious advance of the Mongols, which began in 1206. Their realm of conquest sprawled across 4,000 miles of the Eurasian landmass from the Adriatic Sea in the west to the South China Sea in the east. This vast empire belonged to Khubilai Khan, grandson of the infamous Jingghis Khan and inheritor of his title "ruler of rulers." Despite the supreme arrogance of this claim to overlordship of all mankind, few men or nations dared to dispute it. The Mongol scourge was a terror mercilessly destructive. The Mongols were harsh, pitiless men beaten on the anvil of a hellish homeland. Barren, plagued by searing summers, numbing winters and scouring winds, the steppes grudgingly yielded bare survival, and little more. Consequently, the Mongols emerged as savage fighters who lived and died in the saddle and were as inured to their own suffering as they were indifferent to the appalling cruelties they inflicted on all who stood in their path.

By 1266, most of the known world lay helpless in the thrall of the brutally efficient Mongol armies, and the quaking nations of western Europe feared they were shortly to suffer the same fate. Khubilai Khan was indeed determined to expand his empire, but his predatory gaze fell instead on a tempting target, the island kingdom of Japan. It was an advanced, productive country whose people had created a distinctive culture and amassed sumptuous wealth. And it lay only 115 miles off the coast of Mongol-dominated Korea. The Japanese had never been conquered in recorded history and they owed this good fortune to the narrow belt of treacherous seas that insulated the Japanese archipelago from the wars that frequently swept the Asian mainland.

A friendly invitation to war

Khubilai well understood that war against Japan was a high-risk enterprise. Before even crossing swords with the Japanese, the Mongols would have to make a safe crossing of this perilous sea. Khubilai weighed the risks and gave the order to proceed. His opening move against Japan was the dispatch of a diplomatic note inviting the emperor to surrender his country to Mongol suzerainty. The king of Korea, who was asked to help deliver this message, knew an invitation to war when he saw one.

The message was delivered to the Japanese emperor —a powerless figurehead—and to the military government of the Hojo regency, which actually ran the country. The grim-faced fighting men found Khubilai's letter intimidatory, insulting and totally unacceptable, and packed the Mongol envoys off empty-handed. Then they ordered a strengthening of the

island nation's virtually nonexistent coastal defenses.

Angered by the rebuff, Khubilai ordered plans drawn for an amphibious invasion of Japan. The Korean peninsula, with its many deep harbors and strategic proximity to Japan, was designated as the launching base. Khubilai directed the unfortunate Korean king to ransack his poverty-stricken land to raise a 40,000-man army; to use land, seed, oxen and 6,000 plows to grow food supplies; and to construct a 1,000-junk armada to transport them.

Sea legs for a landlocked people

The invasion was as formidable a task as any the Mongols had faced. As a people only recently emerged from a landlocked ancestry, they had an instinctive aversion to seafaring. Sometimes they had pursued fleeing enemies relentlessly over thousands of miles, only to break off the chase when fugitives took ship. Yet they had always been amazingly successful in adapting their tactics to unfamiliar situations, and the long-running war in southern China had provided a thorough training in naval warfare for their leaders. Captured junks and their crews were pressed into service with the Mongol navy. Chinese harbors and shipyards were assigned roles in the invasion plan as soon as they fell into Mongol hands. The Mongols also embarked on a massive shipbuilding program of their own. Khubilai had ambitious plans for the new fleets: he could not rest until Mongol rule held sway over the entire world. Had not the great Jingghis prophesied, "If Heaven grants a way, you will embark on campaigns across the sea"?

Late in 1274, the Mongol armada weighed anchor in its Korean harbors and put to sea. There were 900 junks, and they bore an invasion force of 25,000 Mongols and their horses plus 15,000 Korean levies of dubious quality. In a rehearsal for the main landing on the island of Kyushu, the armada stormed Tsushima, an island midway between Korea and Japan, then wiped out the garrison on the smaller island of Iki before sailing into Kyushu's spacious harbor, Hakata Bay. The armada anchored off the fortified town of Hakata and staged a dawn attack. The Mongols met no resistance on the beach and swiftly captured a string of coastal towns and villages. The cavalry were mounting to ride against the island's administrative capital when the Japanese counterattacked in the nick of time. The alarm had sounded throughout Kyushu, and from every quarter the military knights and their armed retainers were rallying.

In all matters except courage, the Mongols had the advantage. The Japanese bows were outranged, their forces outmaneuvered. Nothing had prepared them to tangle with the bloody maelstrom of the Mongol war machine in close-quarter battle. They gradually yielded ground but their finely forged blades exacted a heavy toll. Swinging the curved, two-handed swords in glittering arcs, the Japanese knights punished the Koreans, for whom they had little respect, and shed more Mongol blood than Khubilai's men were accustomed to losing. Unknown to both sides, the invasion was already over. Sensing a great storm in the offing, the naval commanders begged the Mongols to re-embark the landing force lest the fleet be destroyed and they be marooned in a hostile land.

The decision was for evacuation and the Mongols began to race back to their ships ahead of the gathering storm. Even as they reached the shoreline, the heavy rains gave way to strong winds. The main force stood out to sea and rode out the gale. Then the invasion fleet limped back to Korea in defeat. The loss of 13,000 lives was less troublesome to the Mongol commanders than the prospect of confessing their failure to Khubilai Khan, who promptly sent new diplomatic missions requiring "the king of Japan" to

Map shows the Mongol 13th-century invasion routes. Khubilai's fleet foundered off Takashima in 1281.

Knight Takezaki Suenaga (left), hero of scroll painting that he commissioned, races to defend Hakata Bay.

At Hakata, Suenaga (center) parades before other warriors, who sit atop earth and stone fortifications.

Confronting Mongol bowmen, Suenaga and mount are wounded as enemy bomb explodes in their midst.

Finally, Suenaga's craft (right), with great mobility, attacks Mongol warship in successful "mosquito raid."

Lost Mongol fleet is found

pay homage to his throne. Outraged, the Hojo regent made Khubilai's envoys atone for their master's impudence with their heads. Both sides plunged with urgency into plans for a continuation of the war.

The disaster that had befallen the foredoomed expedition to Japan did not slow the growth in size and capability of the Mongol navy. Men whose fathers had crossed rivers by clinging to inflated animal hides or the tails of their swimming horses were now commanding capital fighting ships. By 1279, the once inferior Mongol sailors had outfought the Sung in southern China.

With the end of 300 years of Sung rule, China was reunited under the Mongols as Khubilai Khan became the master of more territory than any other ruler before or since and became, as well, insatiably greedy for the riches garnered from his colossal empire. Planning for the second attempt at the conquest of Japan was pressed. Khubilai's cold rage for revenge galvanized the war effort. Under a department with the sinister title "Office for the Chastisement of Japan," Korean and Chinese shipyards were commandeered for war junk production. The Mongols ordered 1,500 warships in 1279, 3,000 more in 1281.

Word of this gargantuan effort reached Japan. This time a far more strenuous defense effort was needed. In Kyoto, the emperor journeyed tirelessly among the Shinto shrines where he petitioned the gods for the annihilation of the Mongols, but the military men were not about to rely on the gods to save Japan for a second time. They hammered out a defense strategy based in part on the belated recognition that Japan needed a navy, and ordered the construction of war junks, modest in size but quick and easily handled. The Japanese were convinced the Mongols would again attempt to land in Hakata Bay and spent five years encircling it with a dirt and stone wall.

Shell-encrusted celadon porcelain bowl was found during a preliminary probe by Mozai's team in March.

Trailing a brown plume of dust that stretched into the far distance, 50,000 of Khubilai's soldiers, many on horseback, and 20,000 Koreans crowded into their Korean embarkation port in the spring of 1281. The waiting invasion fleet seemed to have been stuffed into Pusan harbor. The junks were closely anchored and so numerous that they melded into a confusing morass of ships seething with activity. Scores of sampans ferrying people, stores and orders darted erratically among the giant transports. On the quayside, shouting quartermasters supervised the loading of water casks, provisions, fodder for the horses, and stone missiles for the shipborne slings.

The Mongols went through the unfamiliar process of boarding ship with the self-assured air of battle-seasoned professional soldiers. Their features were coarse, weather-beaten and set in hard expressions. Sweating inside their buffalo-hide armor, they stank of kumiss, the rancid mare's milk that provided the basis of their simple diet, and of many unwashed days in the saddle. Each man carried weapons enough, it seemed, for five more. There were bows, broad-bladed

Other objects retrieved by fishermen and divers include swords, jars and ancient kitchen utensils.

Stone catapult ball, six inches in diameter, still bears traces of oil-soaked cloth on surface.

scimitars, maces, lassos and javelins with a hook for jerking a foe from the saddle. The Mongols were expert with them all, especially the bows, which were placed in their hands during infancy. They grew up as archers of uncanny skill who could turn in the saddle at full gallop and shoot an arrow backward with deadly accuracy.

Each Mongol was issued a file to hone his arrowheads, needle and thread, and a shirt of thick silk, which minimized his wounds. When the wearer was hit by an arrow, the silk would be carried into his flesh, helping the surgeon later extract the shaft.

The Mongols were the spearhead of the assault but they were only part of an invasion tapestry demanding enormous seafaring ability, and unequaled in size and complexity until modern times. When the 1,000-junk Mongol fleet sailed from Korea, it was headed for a rendezvous at sea with a second fleet of 3,500 junks bringing 100,000 troops from ports in southern China. The total of 170,000 men was more than four times larger than the failed army of 1274.

The Korean fleet besieged the hapless Japanese isle of Iki and captured it after a bitter struggle. When the ships raised sail for the northern coast of Kyushu, the bloody corpses of Iki's courageous defenders dangled in chains from their prows. On June 23, 1281, the first light of dawn unveiled a chilling sight that set the hearts of the Japanese coast watchers pounding in their chests. The sea had blossomed across the horizon with a mass of bright sails bearing straight for the shore. Messengers left in furious haste to raise the alarm at provincial and district headquarters. The others stood there as though transfixed, watching the vast armada's eerily silent approach.

Meanwhile, the Chinese fleet would set its helm to the west of Hakata Bay, slipping into the waters of Imari Gulf. At the mouth of this gulf is the island of Takashima. The army of Chinese levies would go ashore throughout this area, with orders to outflank the left wing of the Japanese fortifications. The blood-red flag of the Mongols fluttering at their mastheads, the junks of the Korean fleet sailed into Hakata Bay. Without delay or subterfuge, they headed for the fortress of Hakata, the very heart of the Japanese defense.

When they were so close to shore it seemed they must run aground, the junks abruptly anchored in line and opened fire. Arrows sped through the air in clouds; the artillery hurled rocks and pots of burning naphtha. Incessant booming of the Mongol drums and the raucous blasts of their horns panicked the Japanese horses. The men, though, were of sterner stuff: the parapet of the stone rampart was crowded with thousands of men-at-arms jostling for the chance to shed Mongol blood. They wore ingenious armor fashioned

Lost Mongol fleet is found

from small strips of steel laced together with colorful thongs. The richly embroidered banners of the military knights waved above their heads, a visual reminder to the samurai that the code of loyalty allowed them only two choices: victory or death. The Japanese fought ferociously, withering the ill-fated Mongol landing parties in the surf until the waves broke with crimson foam.

A huge effort enabled the Mongols to take the Shiga Spit, where so many of their countrymen had drowned in the first invasion. They could make no further advance, however, and the main Japanese defense line remained intact. But the Mongol armada was like a knife at their throats. Lacking artillery, the Japanese seemed incapable of driving the invaders off. The diminutive naval flotilla was available, of course, but by all logic it stood no more chance against the Mongol fleet than a mosquito attacking an elephant.

Captain Kono Michiari thought otherwise, or perhaps he simply did not care about the odds. His blood was up and his fever to do battle with the Mongols so great that he camped with 500 of his men in front of the Hakata fortress, in provocative view of the attackers. He had prayed devoutly for this chance. After carefully writing to the gods, he had burned the document and swallowed the ashes. In the final days of battle, Michiari felt seized by divine inspiration. He had his two war junks manned forthwith and recklessly directed the helmsman to steer for a Mongol flagship. Presuming that a handful of men could have no hostile intent, the Mongols took it for a surrender delegation. They held their fire. As the Japanese ships came alongside, Michiari slashed down his mast and clambered up it, sword in hand, to the flagship's deck. The Mongol captain ran forward and Michiari cut him down as his men surged aboard to clear the crowded decks. The boarding party set fire to the flagship and escaped under cover of the smoke with a high-ranking prisoner.

Daring to the point of insanity, Michiari's brilliant foray has been credited with turning the tide of battle. Feeling suddenly vulnerable to the Japanese cutting-out raids, the Mongols hurriedly chained their ships together and stationed fighting squads on boards lowered to the waterline. The mosquito raids continued and drew more from the Mongols than mere blood. Each attack inspired the next in a contagion of valor, and Mongol morale began to falter. One Japanese knight, Takezaki Suenaga, a veteran of the first invasion attempt, was so proud of his own heroism that he later commissioned an artist to document his bold deeds—including the boarding of enemy ships to decapitate the aggressors—for posterity (pp. 122-23).

The dashing maneuvers of the Japanese flotilla stemmed from a request when it was formed that each maritime province contribute crewmen. In many cases they sent pirates with long experience of looting raids on the Korean coast. The wiles and seamanship of the former freebooters gave the Japanese a useful edge. Some of the war junks sank in the hail of Mongol fire—they were so lightly built that one direct hit was often enough—but most were too mobile a target.

Captain Kusano Jiro's junk was heading into the massed ranks of Mongol ships when a crossbow bolt removed his left arm at the shoulder. Undeterred, he completed the boarding attack, left the junk ablaze and returned with 21 heads of Khubilai's warriors.

Dramatic answer to royal prayers

At the end of seven weeks of savage fighting, according to legend, the Japanese emperor personally invoked the aid of the gods. The chief Shinto priest journeyed to a royal shrine with the emperor's pious pleas for a manifestation of heaven's support. The Japanese people have since believed that these prayers were answered that afternoon in the most dramatic fashion imaginable.

In Hakata Bay, the Korean shipmasters of the Mongol fleet began to frown, pace their decks and mutter anxiously to the junior officers. The sky had taken on a yellow pallor and the wind had died away to a dead calm. Yet something was lifting the oily-dark sea into swells that carried deep into the anchorage to set the war junks rocking at their cables. The ominous symptoms pointed to a dread conclusion: a typhoon was about to strike. The Japanese called them "taifu," the Chinese "tai fung"—vast cyclonic storm systems that brewed in the South Pacific and then swept up to rake the Asian waters with catastrophic winds and monstrous waves. No vessel of those times could survive the onset of a typhoon in the open sea. The alarm

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Bronze seal found by Takashima fisherman is thought by Dr. Mozai to have belonged to Mongol general.

of the Korean sailors was mingled with relief that they were in sheltered harbors.

Nevertheless, the Korean captains requested the Mongol generals to withdraw their forces to the ships without losing a moment. The men needed no urging. The day had taken on an evil cast. The heat was oppressive and the air so clammily hot that the Mongols felt as though they were drowning.

Meanwhile, the same fate was befalling the ships grouped farther to the west in Imari Bay, off the coast of Takashima. The seas grew steeper and came in quickening succession. The whole armada was lurching from trough to crest. The sky darkened and went to a brooding blackness that looked solid to the touch. The Mongols and Koreans then knew the worst: they were directly—and inescapably—in the path of an exceptionally willful typhoon.

The wind arrived in a fury and battered the junks over on their beam ends. Cables snapped, sails exploded into fragments and the masts whipped back and forth until they were jerked out of the hulls. Calamitously for the invaders, gales were blowing directly through the entrance channels to both Imari and Hakata bays. The harbors were deathtraps and the dying fleets made frantic efforts to escape. The breakers smashed into the junks and hurled them back to crash one against another in a series of stunning impacts that sent many ships to the bottom in seconds. Waves came in walls of churning water that pounded over the junks, sweeping the decks bare.

A fully rigged ship suffering such a blow would emerge seconds later as a ruined hulk—men, masts and superstructure all vanished without trace. The crippled vessels drifted to the shore, where the surf dashed them to pieces. Not slow to recognize their good fortune, the Japanese swordsmen patrolled the beaches, executing the survivors as they crawled ashore.

After passage of the typhoon, the two harbors presented mirror images of carnage. The sea was literally carpeted with the wreckage from the disintegrated junks. Bodies of men and horses floated in a tangle of spars and timbers so densely packed that survivors could walk out on the surface of the sea. It was a disaster of the greatest magnitude. Barely 500 ships were left afloat from the two fleets. The typhoon had sent 4,000 ships to the bottom and the death toll was conservatively estimated to be 130,000. The surviving vessels scurried back to the Korean coast with the Japanese sea raiders nipping at their heels.

An ironic postscript must be added to this epic sea conflict. In the long term, the episode turned out badly not just for the humbled Mongols, but for the Japanese as well. Persuaded that the kamikaze was evidence of the gods' intent to preserve them against all invaders, the Japanese came to think of their nation as sacred and inviolable. That this notion was ill founded became tragically clear some 700 years later.

Khubilai Khan's reign marked the zenith of Mongol power, and the failure of the Japanese invasion attempts started its decline. The Mongol empire soon went into precipitous retreat. Khubilai dreamed of revenge against Japan until his death in 1294. He even contemplated a third invasion, but public resistance to the idea forced its abandonment.

The final victory belonged to Japan, and so, believes Dr. Mozai, does tangible evidence recovered from the seabed off Takashima. "I don't want anybody else to get to it—it's part of our national heritage," he maintains. The Khubilai Khan relics will be donated to the nearby museum at Imari Bay.

The fishermen of Takashima have cooperated with the excavation efforts, but having lived so long with history washing up on their shores, they find it hard to understand all the excitement. Seven years ago, a man digging for clams came across a curious metal object (left). He tossed it into his toolbox where it lay forgotten until Dr. Mozai visited the island and identified the hunk of metal as the personal seal of one of Khubilai Khan's senior generals. Mozai was hardly able to believe his good fortune. "The man asked me if I wanted to examine it," he said. "And it's quite priceless—a national treasure."

On Takashima, kindergarteners storm monument to Japanese defenders, who twice repulsed Mongols.

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Flashing tools of their trade, 1890s ruffians may have been members of the dreaded Mudhole gang.

By Jack Fincher

A unique theater retells the tale of backwoods feud

In Appalachian revival tents, actors work with descendants of real-life characters to reshape the story of 'the lonesome pine'

Color photographs by Dan Carraco

All along one weathered wall of the revival tent a lozenge of gritty gray light sprang up, pasting the worn canvas with the faded portrait of two mountain men wearing peaked hats and brandishing pistols. It was as if they had posed for some giant, long-ago "Wanted" poster. As well they could have, for these were border desperadoes from one of Appalachia's infamous gangs.

"In 1888 it was, and Doc Taylor had took the job as U.S. marshal to try and stop some of that killin'," intoned Don Baker, who stood with his back to the rear-projection screen, reading the play to dimly lit faces in front of him. His hands were jammed deep in his hip pockets. The audience, a hundred people of all ages, sitting amid the litter of their box suppers and bundled onto folding chairs from the funeral home, seemed oblivious to the cold.

"Right from the first," chimed in Frankie Taylor, who like the two other cast members was distantly related to Doc, "Doc started crossin' some of the baddest of that bad lot." Blind old Orb Caudill nodded. He knew how bad they were. Hadn't his pappy told him?

Posed with projected image of sardonic hero, *Red Fox,* cast includes Frank Taylor, Gary Slemp, Don Baker.

"And the baddest bad man of the mountains," put in Gary Slemp, advancing on cue from the far corner of their bare grass stage, "was a feller by the name of —BAD TALT HALL," bawled all three as their audience rocked almost imperceptibly in recognition. Another spectator spoke up. "Wasn't that Little Talt?"

"Nope, that was Bad Talt," Don Baker ad-libbed. "Though before folks got around to hanging him, Bad Talt wrote in his life story how a lot of the killing had really been done by Little Talt."

"Yessir, Bad Talt sure 'nuff got the blame," added Gary Slemp. The spectator nodded. "Hear tell they's both bad 'uns."

"They was, for a fact," agreed Frankie Taylor without missing a beat. "Like old Iry Mullins we fixin' to tell you about."

Driven out of character at last, Don Baker turned on the other two and laughed. "Where are we?"

That's not exactly how it happened, of course—what story ever is? But allowing for a little Kentucky windage in the telling, it is about as near the mark as memory ever gets. Which is why the Roadside Theater of Whitesburg, Kentucky, is dramaturgy with a difference: a hybrid form of play-acting as organic to this hardbitten coal country as the Cumberland walnut, an Appalachian oral history carefully crafted into down-home docudrama.

In *Red Fox/Second Hangin'* performers bereft of sets, costumes and props just talk. They move easily through a multitude of roles—women and children, young men and old—with artfully artless narration that ranges from your-turn cracker-barrel soliloquy to what co-author Dudley Cocke likens to "a bunch just busting to tell you a story they all know. Batting lines back and forth, saying some phrases in unison, feeding off each other's rhythms." The result is magic.

One hundred and twenty-five thousand dollars a year must be raised in box office receipts, in grants and endowments to meet the budget. Baker and Cocke are gratified by the reaction from back-country hills and hollows where the company's old van takes the troupe every summer, after nine months of playing schools, colleges, festivals and prisons. Dozens of letters pro-

Cumberland mountain family scene is backdrop for Baker's introduction to dark deeds in Appalachia.

Tucked in against the chill of early autumn evening, this couple watches Roadside Theater tales of long ago.

vide heartening evidence that Roadside is achieving its objective: giving art back to the places and people from which it sprang, and convincing them they have a heritage worth cherishing.

"You and your group cannot know what your stories meant to my family," one Tennessee mother wrote. "Donnie wants to develop a style of storytelling all his own. It would thrill me to pieces if he has inherited some of my daddy's ability."

As for the kids themselves, a one-paragraph letter from a rural Kentucky lad is typical: "When I first heard about it, I didn't think I'd like something like that, you know, a play. But I really liked it. It's a whole lot better than watching TV."

Roadside Theater grew out of Appalshop, a once-federally funded workshop in film, photography, records, videotape, books and magazines devoted to life in Appalachia. The seeds were sown in 1971 when Don Baker, disenchanted by life in the nation's capital as a psychiatric therapist, returned home to Wise County, Virginia, across the border from Whitesburg.

As an undergraduate, he had been the first to direct a full-length play at Washington and Lee. "I was embarrassed to be a hillbilly. Like many mountain people, I felt I didn't have a thing to crow about. It wasn't until I had been gone a few years that it dawned on me—I was not only homesick; I had left behind important values."

Attentive coeds of Clintwood, Virginia, high school take in workshop before evening performance.

Three generations are spellbound as drama of Doc, Bad Talt and Devil John is played out.

One day Appalshop asked him to take over a theater. Conventional theater seldom came to the mountains, and when it did, it rarely made much of an impression. Baker decided the challenge appealed to him—if he could find "a form that made sense to the people who lived there."

His theater would look his neighbors straight in the eye and tell them stories. Stories that would resonate with rich meaning because they knew them already, and had only to be reminded by someone who could dramatize their native treasure of wit, wisdom and imagination. Who, in mountain vernacular, not only savored the words and their significance but "saw to it the salt didn't get took out of the gravy."

Says Baker: "What we decided to do was take a language and style common to mountain people and enlarge it for several storytellers."

But what story, for starters? He chose the legend of his kinsman, Red Fox—the red-bearded, red-haired Doc Taylor. Healer and herbalist, surveyor and scout, lawman and ladies' man, visionary and philosopher-preacher, Doc Taylor was manifestly out of step in those mountains. Dangerously so, as it turned out.

As the title implies, Red Fox had been the second man hanged in Wise County. He had "scouted out" and brought to justice the first, Bad Talt Hall, while a federal marshal. Then, in 1892, paralyzed moonshiner Bad Iry Mullins, "mean as a striped rattlesnake," his wife Lourenzy, "mean as any man" and three of their Mudhole bunch were killed in a masked ambush near Pound Gap. Since there was "real bad blood" between Iry and the lawman—Iry "offering 200-300 dollars to have Doc Taylor kilt" and Doc saying one more row with Iry and "he'd shoot the horses first and then he'd git what was in the wagon. . . . A lot of folks started layin the blame to him."

This much was fact, everybody and his grandchild in central Appalachia knew it. In the last decades of the 19th century that part of Appalachia was still an isolated remnant of the American frontier. Half its people still felt a kinship with the spirit of the Revolution and identified with Kentucky-born Abe Lincoln; half thought of themselves as Southerners because of their geographical location, although they owned few slaves; slavery was not an issue. So with the Civil War—Silver War, in mountain dialect—sympathies were divided between North and South, pitting neighbor against neighbor, splitting families. ". . . Bad Talt Hall come on one of his uncles who'd been asidin' with the Yankees. He up with his hog rifle and blowed his uncle's head off. . . . After that he jumped up on a ole log flapping his arms an' crowed like a banty rooster. . . ." Passions ran deep, memories were long and grudges kept alive in war's aftermath. Then something happened to intensify the rivalries, the outlawry, the traditional feuding.

Promoted by industrialists and fast-buck entrepreneurs from the Northeast and Britain in the 1880s, central Appalachia experienced a timber and coal boom akin to the California gold rush of 1849. The hamlet of Big Stone Gap, astride the tumbling Powell River ideal for waterpower development, sur-

A frequent contributor to SMITHSONIAN, *Mr. Fincher wrote about a Victorian ceiling painter in October and the Society for Creative Anachronism last June.*

rounded by virgin stands of walnut and chestnut, atop rich coal seams, could be "the Pittsburgh of the South." Promoters poured in, sparking a boom mentality; land titles were hawked on the plank sidewalks. In 1891 a railroad was pushed through. Moonshining and killing got out of hand, nowhere worse than in an outlaw hangout just over the Virginia line, a gambling, drinking, shooting, whoring spot known as the Mudhole. Doc Taylor, the Red Fox, was made a U.S. marshal in 1887 "and it was his job to clean up all that mess over around the Mudhole. . . ."

Among the entrepreneurs who had come in to ride the boom was John Fox jr. Doc Taylor became a pivotal character in Fox's best-selling 1908 novel, *The Trail of the Lonesome Pine*, which in Don Baker's view promoted the conventional attitude that hillbillies had to put on shoes and move to the city if they were ever going to amount to anything.

In the stories passed down orally to Baker's generation, however, Doc has emerged as a more sympathetic character. Marshall Benton Taylor studied at Louisville Medical College but continued to practice the herbal medicine of the mountains as well. "He couldn't be beat birthing a baby," it was said, and "a-curing the flux."

A mystic, Doc had studied the theology of Emanuel Swedenborg, and on occasional Sundays stepped into the pulpit as a rousing Regular Baptist lay preacher. He could "slip through the wilderness unnatural like . . . he be clean across the mountain . . . jest like a red fox." As a natural conservationist who loved the mountains, he resisted "having Pittsburgh at his back door"—the coal boom would end up exploiting his people and destroying their way of life.

Baker picked up subtle hints that Doc had been framed and railroaded by the local establishment. That establishment, personified by Devil John Wright, was formidable. As a trick rider and sharpshooter in John Robinson's circus, Wright had performed for Queen Victoria. He worked for the Pinkertons, was a U.S. marshal and a moonshiner. Then he started buying up land—a big timber operation, farms, sheep and cattle. When the boom came he negotiated profitable deals for himself while serving as go-between for the entrepreneurs.

Devil John's cat's-paw was Bad Talt Hall. "Devil John got to be a rich man . . . and Talt allus do John's dirty work. But then John allus watched out for Talt."

Although "whiskey and bad women was Talt Hall's problem . . . the murder of Sheriff Enos Hylton in Norton was his mistake." "Doc took up Talt's trail, tracked him clean out to Memphis, Tennessee. . . ." While Talt was in the Wise County jail awaiting hanging it was rumored Devil John planned to "dynamite the town and batter down the jail" to rescue him. He was foiled by a strong, round-the-clock guard force.

An ally from the Tidewater

What was the truth? To help him find out, Baker called on his old classmate, Dudley Cocke, a sometime poet. Although Tidewater Virginian by birth and upbringing, Cocke was just the ally Baker needed, for he had experienced that same shuddering dislocation Doc Taylor had envisioned—and Don Baker had suffered in Washington—without leaving home.

He had grown up in a small coastal town, the dunes full of wild flowers and grapes, a fine stretch of beach, seashells by the bucketful, an ocean so clear you could see your feet in the water. Then a bridge and tunnel were put in to make possible one of the world's largest seaside resorts. Soon the dunes were full of houses, the water was muddy, and the beach had no shells. "At the time," he says, "nobody saw what they were giving up for what they were getting. There was nobody to speak up anyway, they were too busy selling out."

Now he found himself summoned to a town that seemed gouged from the sooty earth like an ugly seam of coal. But a town so good-natured it proclaimed on a billboard, "Welcome to Whitesburg, Population 1,199 Friendly People—Plus One Grouch."

Baker went about recruiting amateur cast members Taylor (a bottomland farmer) and Slemp (a recording studio owner), and the two authors took turns burrowing into history books, newspaper clippings, court records, community memorabilia—and people. They interviewed nearly two dozen old-timers who were either related to the principals or had eyewitness or personal knowledge of the events. The search also turned up old photographs in the Alice Lloyd College archives in Pippa Passes, Kentucky, and the Southwest Virginia Museum at Big Stone Gap.

Imperious visage of Devil John Wright, rich man of the mountains; he hired Bad Talt (right) to do his dirty work—but failed to save his henchman from the noose.

Two days before his hanging, Bad Talt Hall exhibits none of the "screamin an a hollerin" that marked his incarceration. His jailmate Red Fox read Bible.

William T. "Chid" Wright, 84, wrote biography of his father, Devil John, that portrays Doc Taylor as "cunning, well-educated and desperate. No deed was too bloody and no crime too staggering for him. . . ." John claimed Doc killed Mullins for money, and that it was he, Wright, who had brought Red Fox to justice, tracking him for days in the Cumberlands, sometimes on hands and knees through mountain laurel, finally surprising and arresting Doc while he ate breakfast.

Vigilante group, the Home Guard, surrounds Wise County jail where Bad Talt awaited execution in 1892. It was rumored Devil John planned Gatling gun and cannon attack on jail to free his friend. Doc Taylor was being held in the same jail.

MURDER OF A FAMILY.

Most papers, like *Police Gazette* of August 20, 1892, made Doc the villain of Mullins' ambush.

Doc designed his own enclosed gallows, similar to these, leading to belief he survived hanging.

Cocke and Baker struck a mother lode in the Wise County courthouse. Under a two-inch-thick layer of coal dust in the attic, amid empty Rock-and-Rye bottles and dried orange rinds were the court accounts of Doc Taylor's trial for killing the moonshiner, Mullins. (Awaiting trial, Doc had wound up in a cell near his old enemy, condemned-to-hang Bad Talt Hall.) Evidence against Red Fox had been flimsy and circumstantial at best. The two survivors of the ambush, Mullins' son and his sister, were prosecution witnesses. "Now the boy what got away, said he never seen nothin', and at first, the woman, Jane, said she never had no idea who them men was. [But] that woman had changed her story complete and said . . . hit was old Doc Taylor."

Preaching on the jailhouse porch

Spent shells at the murder scene had been from a rim-fired Winchester rifle; Doc's was center-fired. As the trial wound down, the judge "asked Doc if there was anything more he wanted to say and Doc says no, a friend will speak for him—'Jesus Christ.' Now that judge was kinda hard of hearin' . . . and he turned around to the clerk and . . . just as straight and sober as a judge is supposed to be said, 'Well, bring him around, Charley, and have him sworn in.' "

The judge did allow Doc to hold a preaching service on the porch of the jail the Sunday before he was hanged. Beard and hair neatly trimmed, he wore a snow-white suit his wife Nancy made out of an old linen tablecloth.

Like testimony at the time, personal recollection 80 years later only deepened the mystery. There were those who claimed they knew who tipped off the arresting officers in Bluefield, West Virginia. Others insisted his hanging had been a hoax, that Doc's life had been spared by a spring-harness rigged within the enclosed gallows by fellow Masons who then buried a railroad tie in an unmarked grave, that Red Fox had fled to Missouri where he lived and died peacefully, and that he had been seen as a missionary in Africa. But no one who professed to know these things was ready to state them for the record because, as they solemnly told Cocke and Baker, the hills were full of everybody's blood relatives—and everybody's blood—and it was "just too soon to talk about."

They do talk about the great event of May 19, 1894, a year after Doc's hanging, ". . . she come a ten inch snow fall . . . covered that whole county in a suit of snow white . . . the corn crop weren't good for nothing that year and the moonshining business come to a grinding halt." Folks said that old Doc had had the last word.

Red Fox/Second Hangin' opened in 1976 at an

Alabama prison. In the years since, the audience response has been electrifying. "Why, that house," someone will marvel aloud as a slide is flashed, "is still standing over on Big Beaver." "Is that old Arch Hopkins?" another will ask. A third, hearing the exploits of Doc Taylor: "And they hung a man like that?"

"People come to see if we've got the story right," says Baker. "They talk back to us if they think we're making a mistake," adds Taylor.

One woman Cocke knows has come to see *Red Fox* a half-dozen times, bringing with her every time someone new and a tidbit of fresh information, details that, to her delight, often have found their way into the script next time she attends.

Urbane theater critics have been warmly receptive. Praising the troupe's performance in an unpretentious church as "marvelously resourceful," the distinguished critic emeritus of the *Washington Post*, Richard L. Coe, suggested it would be "an impressive attraction for Arena Stage, the Kennedy Center, Ford's Theater or the White House East Room."

Roadside is buzzing with future plans. They've finished a children's record of *Mountain Tales*, a radio serialization of *Red Fox*. They are one of only three theaters in the country selected by the National Endowment for the Arts "to pioneer the professional theater's reentry into TV." The grant helps support a video adaptation of *Red Fox*, with live audiences in a small community center and in homes. A package of three filmstrips with sound, illustrated with drawings, will go to schools. "We've so many more requests to appear than we can handle, this is our solution," says Dudley Cocke. This month a new show begins rehearsal, Ron Short's *Cities of Gold*, set to his music. February brings a tour of Nevada, Las Vegas as well as smaller towns, and perhaps on to the Coast.

Meanwhile, Taylor farms, Slemp records, Baker is a contractor and Cocke minds the store. Is there any idea of their all devoting full time to Roadside? Not in the foreseeable future. "We think there are real benefits in our having other jobs in the community," says Cocke. "After all, many preachers do."

Red Fox's great-grandson Ed Baker shows Dudley Cocke the spyglass his ancestor used to track pursuers.

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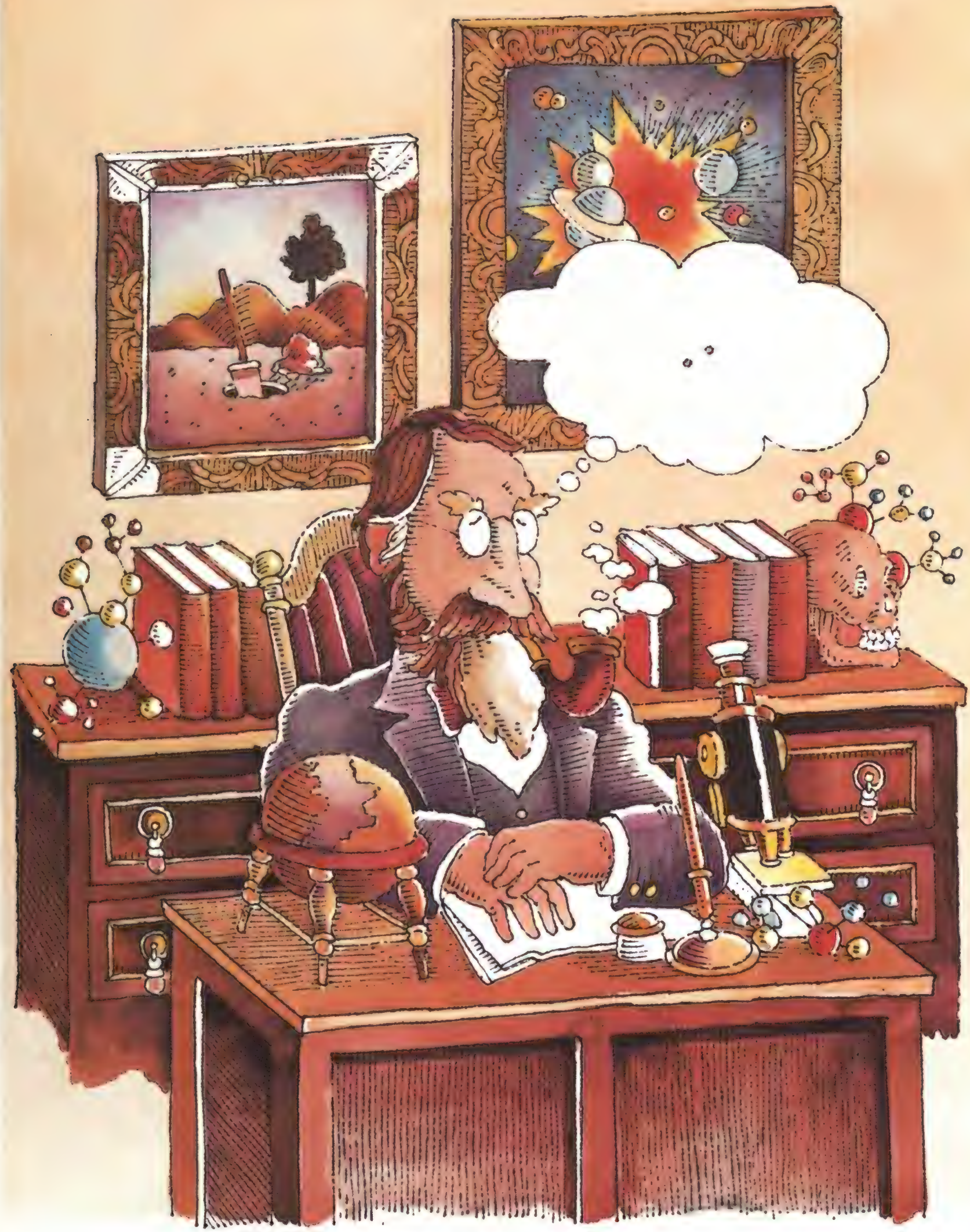


By James S. Trefil

'Nothing' may turn out to be the key to the universe

Inside a perfect vacuum is a world as busy as pond water seen under a microscope; the activity has cosmological implications

Have you ever tried to picture a vacuum? A real vacuum, with absolutely nothing in it? I have to admit that I can't. Whenever I try, I always wind up thinking of an empty space between a pair of material objects—two atoms, or maybe two stars. The human mind has difficulty in picturing a state of true nothingness; the concept of the vacuum has always generated debate among scientific thinkers.

Thinking about the vacuum today can be even more of a strain on the mind: it turns out to be nothing, just as we always thought, but a nothing with energy and structure. It may be even that our everyday universe with its solid matter is nothing more than a lower state of a more energetic universe that would appear to us as a vacuum.

Throughout most of history—well into the 19th century, in fact—the prevailing opinion was that there just had to be *something* to fill up all the empty space between material objects. In 1881, however, Albert Michelson and Edward Morley, two American physicists, presented experimental proof that there really is not any material pervading the universe and filling in all the voids. In so doing they established the existence of the vacuum once and for all.

But the problem refused to remain solved. The discovery of antimatter in the 1930s raised the possibility that what appears to be a vacuum might, if examined on a small enough scale, exhibit a sort of fleeting structure. Today, that structure figures strongly in one of the most exciting intellectual adventures ever undertaken by science—the attempt to trace the history of the universe back to the very beginning. Moreover, theoretical physicists have speculated that it might be possible to go beyond this beginning point and probe a still more fundamental question—why there is a universe at all. After all, asking why there is something instead of nothing is simply another way of asking why the universe itself is not a complete vacuum. So although the study of "nothing" may appear to be a singularly unrewarding endeavor, "nothing" may in fact be the key to finding the answers to some very compelling philosophical questions.

As with so many long-standing intellectual debates, the arguments about whether there was such a thing as a real vacuum started with the Greeks. Aristotle felt that there could be no such thing because he believed that for anything to move, something had to push on it. Anything in a true vacuum, then, would be condemned to an eternal stability and, since we know that everything does move sooner or later, it follows that nothing can be surrounded by a vacuum.

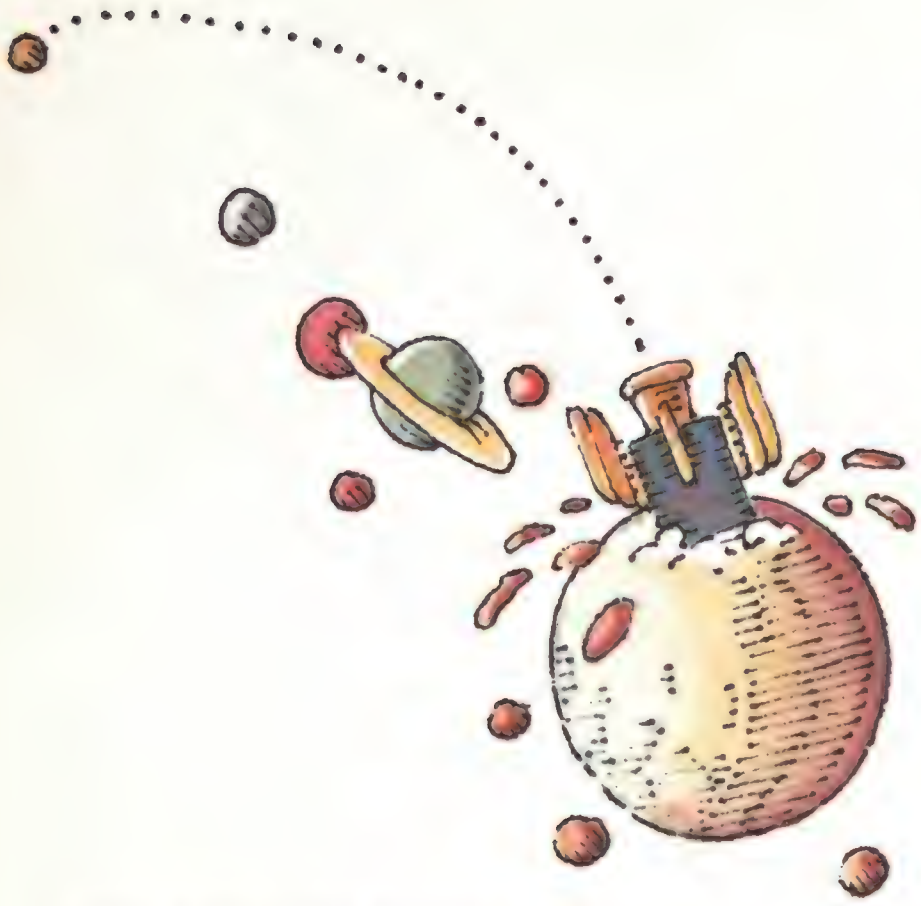
So forceful did this line of reasoning seem, and so great was the prestige of Aristotle, that we find essentially the same argument being used by Descartes in the 17th century. How, he asked, could the Earth be made to move around the sun if something weren't pushing it? Clearly, nature not only abhorred a vacuum, but found it completely unthinkable.

Today, of course, we know that this sort of argument isn't valid. We routinely send space probes to the far reaches of the solar system, and once these probes are launched, they have no further need for propulsion. The truth is that, once something starts moving, it will keep moving until something else makes it stop. Once you realize this fact, you see that the vacuum is really quite "thinkable."

In opposition to the Aristotelian viewpoint, there was in Greece another group of philosophers called

Thinkers have struggled with concept of nothingness for centuries, only to find that vacuums are not empty.

Illustrations by Cameron Gerlach



Interplanetary probes prove it is no problem to travel through a vacuum, despite ancient doubts.

atomists, whose followers remained a slightly disreputable minority until well into modern times. They believed that matter was made of small indivisible units called atoms, and that the space between atoms was completely empty—a true vacuum. In retrospect we know that they were right all along, of course, but they never succeeded in convincing their contemporaries.

Practical applications of the vacuum eventually forced everyone to admit that there could be such a thing as an absence of air, but Aristotle's legacy couldn't be killed that easily. Forced to admit that all of the air could be removed from a container, philosophers fell back on the concept of the ether. Ether was supposed to be a colorless, tasteless, undetectable fluid that fills all the empty spaces in the universe. At this point, I imagine, philosophers felt confident that they had set things up in such a way that scientists could never prove them wrong.

But even this compromise was not destined to last. Michelson (who in 1907 became the first American awarded the Nobel Prize in physics) reasoned that if the ether did indeed pervade the universe, then the motion of the Earth should produce an "ether wind," much as driving a car in still air produces a "wind" for the occupants. If a beam of light is directed across this "ether wind," it will be deflected in the same way that a boat crossing a rapid river will be swept downstream. Using delicate optical techniques, Michelson and Morley showed that there was no evidence whatsoever for an ether wind, and hence no evidence for an ether.

So the idea that the texture of the universe is woven from bits of matter separated by regions of vacuum came to be the dominant view of scientists about a century ago. It's an appealing viewpoint—one that is very simple to grasp. Indeed, when we talk about a vacuum today, we usually refer to some region of space (the inside of a TV tube, for instance, or the lining of a thermos bottle) from which air and other matter has been extracted, usually by means of a pump.

Perhaps the best way to visualize what we usually call a vacuum would be to imagine a half-inch thimble. If the thimble were full of air, there would be many atoms in it—thousands of quadrillions of them. If you put it on your finger, the denser material in your hand would send the count to a thousand times this. If you put it inside a TV tube, the number of atoms would drop to a few billion. If, on the other hand, you went to a laboratory and put the thimble in the best vacuum that could be created artificially, it would hold only about 500 atoms.

In near-Earth space or on the surface of the moon this number would go down by a factor of ten (we still can't produce as good a vacuum on Earth as nature has provided a few miles up, which is one reason why the exploration of space can be expected to lead to new industrial advances). Finally, if we took our thimble out to the empty spaces between stars, we would expect it to hold, on the average, only one atom. This represents the best vacuum in our galaxy.

These numbers show us that even the vast spaces between stars contain occasional stray bits of matter. But if we imagine this space filled with our thimbles, each thimble would have only one atom rattling around in it. The rest of the space in the thimble

When a subatomic particle and its opposite number meet, they annihilate each other, leaving only energy.

would be truly free of matter and consequently would represent the ultimate vacuum.

While the view that space contains either matter or vacuum is a comfortable one, the increased knowledge of the atomic world that has been gained during this century has tended to lead toward a more complex view, one in which the space in the thimble, if examined in close enough detail, is seen to have an evanescent, almost ghostly type of material structure. In a sense, the period of time when the best scientific evidence stated that the vacuum is really empty lasted only about 50 years.

The most important element in the modern view of the vacuum is the existence of antimatter. In 1932 (just four years after P. A. M. Dirac predicted its existence), a strange new particle was seen in the debris resulting from the collision of a cosmic ray with an atom in the atmosphere. This new particle had the same mass as the electron, but the opposite electrical charge. Carl Anderson, then a research fellow at the California Institute of Technology, performed the experiment, so he had the privilege of naming the new discovery. He called it the positron (for its positive charge). The particle he saw was the first piece of antimatter ever detected.

If holes were dug and refilled in an otherwise featureless field so quickly that we could not see it happen, the situation would be analogous to particles appearing and disappearing in a vacuum.

Pairs created from nothing

The most striking property of bits of antimatter such as the positron concerns their behavior when they get near an ordinary particle like the electron. The two particles come together and annihilate each other. They disappear as their mass is converted entirely into energy, a direct verification of Einstein's famous $E = mc^2$. The reverse process, in which a large amount of energy can be converted into mass and the particle-antiparticle pair created from nothing, is performed routinely in physics laboratories around the world.

In the years since Anderson's discovery, many different kinds of antiparticles have been seen. It appears that every time we find an ordinary particle in nature, we will be able to produce its antiparticle, if we try hard enough. In each case, the antiparticle and the particle have the same mass, but in all other respects they are the opposite of each other.

An analogy can help explain the properties of matter and antimatter. Suppose we were standing on a level field with a shovel. We could dig a hole in the ground and pile the removed dirt next to it. This would require some expenditure of energy on our part, of course, but when we finished we would have taken the level field and turned it into one that had two things in it—a pile of dirt and a hole. If we equate the level field with the vacuum, the pile of dirt with an ordinary particle, and the hole with an antiparticle, then the digging process is just what we have described as the conversion of energy into matter—the creation of a particle-antiparticle pair.

If we now took the shovel and filled in the hole, the final product would be a level field again—a vacuum. If we did this, some energy would be released as the dirt dropped into the hole, resulting in a (very small) increase in the temperature of the dirt. Filling in the hole, then, would correspond to the process of annihilation in which the particle and antiparticle disappear and the only thing left is energy. In the case of the dirt this energy is present in the form of heat; in the case of electrons and positrons it's in the form of gamma rays, but the principle is the same.

In our normal experience, we would not expect holes and piles of dirt to appear spontaneously in an open field. A physicist would say that this sort of thing can't happen because it violates the principle of conservation of energy. Someone has to expend energy to dig the hole, and unless that energy is supplied, nothing will happen on the field.

But suppose we looked at the field now, went about our business for an hour, and then came back and looked again. Could we be sure that during our absence someone had not come, dug a hole, and then

A professor of physics at the University of Virginia, Dr. Trefil is the author of From Atoms to Quarks. *He last wrote for* SMITHSONIAN *in the April 1980 issue.*

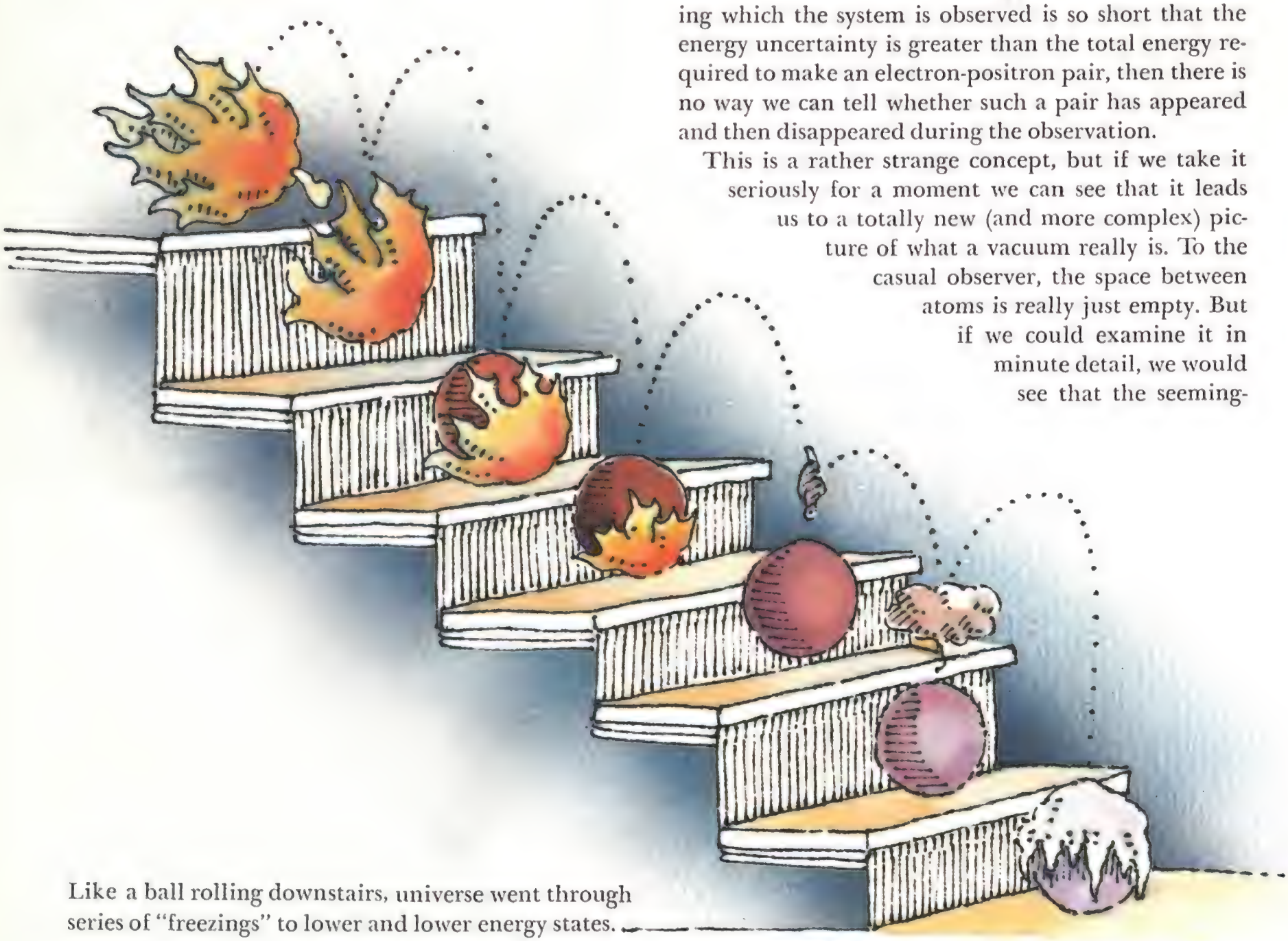
filled it up again? All we actually observe is that the field is level at the beginning and end of the hour, and anything could have happened in between. If we pursue this thought, we realize that no matter how closely we watch the field, we cannot rule out the appearance and disappearance of a hole, provided that the process takes place in a sufficiently short time. If we look every second, the hole could appear and disappear in a tenth of a second. Even if we take continuous high-speed movies, it could happen in a time which is short compared to the time it takes to expose a single frame of film.

So long as we restrict our attention to large-scale things like piles of dirt, this seems a reasonable way to proceed. When we start to talk about microscopic things like electrons and positrons, however, we run into a basic problem. The only way we can detect the presence of a subatomic particle is to bounce another subatomic particle off it. Unlike the pile of dirt, which is not affected by the light from our camera, an electron or positron cannot be measured without affecting it in some way.

This fact—that the measurement of a subatomic system must change the system—gives rise to something known as the uncertainty principle. In practical terms, it means that if we want to know two things about a system—its energy and the time at which it has that energy, for example—the measurement of one variable will change the result for the other. If we want to know precisely the total energy that a system has, then we have to make our measurement over a long period of time and we can't be very accurate about the time at which the system has that energy. Conversely, if we measure for a very short period, so that we know the time precisely, then we only know the energy within some rather wide limits.

For ordinary large-scale objects, this limitation on measurement isn't important because the limits imposed by the uncertainty principle are far below those of even the best instruments. But for small subatomic systems, they become very important, and they are extremely important in the modern conception of the vacuum. Consider the following point: if the time during which the system is observed is so short that the energy uncertainty is greater than the total energy required to make an electron-positron pair, then there is no way we can tell whether such a pair has appeared and then disappeared during the observation.

This is a rather strange concept, but if we take it seriously for a moment we can see that it leads us to a totally new (and more complex) picture of what a vacuum really is. To the casual observer, the space between atoms is really just empty. But if we could examine it in minute detail, we would see that the seeming-



Like a ball rolling downstairs, universe went through series of "freezings" to lower and lower energy states.

ly cold lifeless vacuum is, in fact, teeming with activity. In a sense, this situation is not too different from the experience we have in our first biology course, in which a simple drop of water is seen to be full of living things. The primary difference between these two situations is that, in the case of the vacuum, the matter-antimatter pairs must disappear in a brief time, while in the case of the water drop the microorganisms are always there, waiting to be revealed.

By this time, you may well be wondering what the point of this sort of speculation is. After all, if the particles in the vacuum disappear before they can be measured, what difference can it possibly make whether they are there or not? It turns out that there are consequences that actually can be seen in the laboratory.

Think of a simple hydrogen atom—one electron circling one proton—sitting alone in space. In the empty space all around it, electron-positron pairs are appearing and disappearing at irregular intervals, with the randomness of popcorn in a popper. If one of these pairs should appear near the atom, then the electron going around in its orbit would feel a short push or pull from the electrical forces exerted by the pair. Instead of going around in a serene, undisturbed path, the electron in the atom would be jostled. This jostling, in turn, would affect the light emitted by the hydrogen atom. It won't be a big effect, of course, but it will be there. Its effects were first seen in light emitted from hydrogen in the late 1940s.

The dance of atoms is affected enough to be seen when particles appear out of empty space near them.

This effect provides a concrete test of the notion of the vacuum that we have developed. If there were no process by which pairs were being created and destroyed in a continual, ever-changing pattern, there would be no effect in the emissions of hydrogen. The fact that these effects of the structure of the vacuum (as well as many others that we needn't go into here) are actually verified in the laboratory tells us that, even though these pairs disappear before they can be measured directly, we can know they have been there.

No mere laboratory curiosity

If the story of the vacuum stopped at this point, it would be merely an interesting sidelight in our view of modern science. In the last few years, however, the vacuum has taken on a new significance. As physicists have learned more and more about elementary particles and the forces that operate between them, they have begun to trace the development of the universe backward to the very early moments of creation. According to our present ideas, the universe was created in an explosion called the Big Bang and has been expanding ever since.

At the very earliest times, all of the matter that is now spread throughout the galaxies was compressed into a small space, and the densities and temperatures were beyond anything known in the present era. In this primordial fireball, species of particles existed with masses billions of times greater than that of the proton. Interactions took place which have long since ceased to be important in our everyday world.

What physicists are trying to do right now is to take the universe as we see it, take the faint evidence left from this early fireball, and deduce from them the laws which must have operated in the beginning.

If we go back not to the first minutes or even seconds of creation, but to the first 10^{-36} seconds after the Big Bang (that's a decimal point with 35 zeroes and then a 1 after it), the universe we would see would bear no resemblance at all to the one we know today. The temperature would be so high that all of the matter around would behave in the same way, regardless of its electrical charge or mass, and all of the forces between particles would be the same. A physicist would say that this situation represented a high degree of symmetry. As the expansion of the universe progressed, the fireball cooled off and distinctions between particles and forces began to become important. The symmetry began to disappear.

Perhaps the best analogy to this process would be the freezing of water. In the liquid state, water is highly symmetrical. If we were suspended in a bathysphere in the ocean, we would see the same thing (liquid water) no matter in which direction we looked. A physicist would say that the liquid water represented a state of high symmetry, because what we observe does not depend on the direction in which we look. If

There's more to a vacuum than meets the eye

the water were to freeze, however, this situation would change. We know that ice crystals are hexagonal in shape, and hence frozen water no longer has the same degree of symmetry as liquid water—it does make a difference which way you look in a block of ice.

In just the same way, we can think of the universe undergoing a series of "freezings" during which symmetries vanished. For example, at one stage in the early universe, the temperature was so high that the strong force (which holds the nucleus together), the weak force (which governs radioactive decay) and the electrical force were indistinguishable from each other. This is a situation with a high degree of symmetry. The temperature fell as the universe expanded, however, and a "freezing" occurred. Afterward, the strong interaction was distinguishable from the other two. Later on, another "freezing" separated the weak and the electrical forces, leaving us with our present universe in which the three forces are quite different from each other—a situation with a low level of symmetry. (The exact order of these "freezings," as well as the time at which they occurred, are the subject of some debate, but they all happened well before the universe was a second old.)

When water freezes, the energy of the ice is lower than that of the water which preceded it. We know this because we have to add energy in the form of heat to an ice cube to get it to melt back into the water. In just the same way, the total energy of the universe after each "freezing" is lower than it was before. In a sense, then, the early evolution of the universe is not too different from a ball rolling down a flight of stairs. In each case, we have a system proceeding to a state of lower energy, and in each case the progression is discontinuous instead of smooth.

But where does the vacuum fit into this scheme of things? We have seen that the vacuum is not simply the absence of matter—that the vacuum is, in fact, a system which contains matter. Of course, this matter is not the permanent state we're used to, but consists of the kinds of transitory particle-antiparticle pairs we've described. Nevertheless, it is perfectly reasonable to talk about the energy and symmetry of the vacuum, just as it is reasonable to talk about these qualities for any of the stages through which the matter of the universe has progressed.

And this, in turn, leads to one of the most exciting ideas that I've encountered in a long time. One persistent question that always comes to mind when discussing the Big Bang concerns the nature of the universe *before* the initial explosion. Some scientists simply refuse to consider this question, pointing out that it is not, properly speaking, a question that can be answered with the techniques of science. Others postulate that the present expansion of the universe will someday reverse itself, and that the subsequent contraction will produce once again the infinitely dense state that will serve as the beginning of a new Big Bang. To these scientists, the universe is a never-ending cycle of expansion and contraction, so the question of what was there before the universe is meaningless—there never was a "before." Both these positions are intellectually defensible, and I have often used them when asked difficult questions by my students. But I have always found them to be unsatisfying.

The vacuum may hold the answer

But now we have a new way of approaching this question. If we think about what must have existed before the beginning of our present universe, the best candidate is nothing—the vacuum itself. The question of why the universe exists, then, comes down to the question of why matter in its present form should have come into existence out of the primordial vacuum. Once we realize that the vacuum is not a total absence of matter, but just a state in which matter has a certain rather specialized form, the question loses its mystical overtones and becomes one that can be answered, at least in principle, in scientific terms.

We simply want to know whether the state that we call the vacuum has a higher energy than the state that began the Big Bang. If it did, then the appearance of stable matter out of the vacuum would simply be one more "freezing" of the type that occurred several more times as the universe expanded. The universe would be here for the same reason that a ball rolls downhill —the energy of the universe with matter is lower than the energy of the universe without, and nature always proceeds to a state of lowest energy.

Now I have to emphasize that this scenario is a hope

—a speculation—based on some tentative current trends in theoretical physics. There are many ways in which it could fail to be realized. The theories used to trace our way back through the Big Bang could turn out to be wrong, or the calculations we are doing might be giving us misleading answers. It might turn out that the energy of the vacuum is lower than the energy of the matter-filled universe. But whichever way things turn out, the fact is that for the first time in the history of science there seems to be a way to apply knowledge gained in our laboratories to questions relating to events billions of years ago.

Perhaps this point was made best by Sidney Drell, a well-known theoretical physicist and the deputy director of the Stanford Linear Accelerator Center in Menlo Park, California (and my thesis adviser): "When the universe began, we were sitting on a mountaintop where everything appeared to be the same no matter which way we looked. We've been rolling down that mountain for billions of years, and now everything is unsymmetrical—we have the mountain on one side and open air on the other. What physics gives us is a telescope that lets us look back up the mountain and see what it was like at the top."

Or just possibly, we might add, what it's like a little beyond the top.

Science is trying to see back up to the top of the mountain where the whole story started so long ago.

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Photographs by Michael Lawton

John Bull, at 150, can still make it down the tracks

World's oldest operable locomotive moves from display stand to iron rails to celebrate its gala anniversary

Whistle tweeting, steam billowing, *John Bull* hurries to greet party guests.

Never has so small a locomotive enjoyed so large a birthday party. On a sunny day beside the Potomac River, *John Bull*, the world's oldest operable steam locomotive, celebrated the 150th anniversary of its first trial run in the United States. How? Why, by making another run, age notwithstanding, tugging along an ancient coach with costumed passengers.

John Bull's original trial run, way back then, was on the Camden and Amboy Railroad in New Jersey. Part of that historic line lives on in the present Washington-New York stretch where Metroliners whirl through at three times the best speed of their tiny, ancient ancestor. A couple of years after it started, *John Bull* was taking New York passengers, fresh off a steamer, right down the length of New Jersey at up to 35 miles an hour. A ferry carried them into Philadelphia. The engine served thus until about 1850. In 1866 it was retired.

It continued, however, to make appearances. It showed up at the Philadelphia Centennial Exposition in 1876 and at an exhibition in Chicago in 1883, just before it came to the Smithsonian. It chuffed off to Chicago for the Columbian Exposition of 1893, marked a railroad anniversary in Baltimore in 1927 and showed off as a stationary exhibit at world's fairs in 1933 and 1939. In 1980 it ran again to make sure it wouldn't act up at its birthday party.

It acted up a little. The throttle stuck and the Smithsonian crew took it apart and put it together again, explaining to the throng that engineers sometimes had to do the same thing 150 years ago.

At last the ten-ton engine decided to cooperate and off it went, steam whispering from its cylinders, tender and coach gently rocking, crowd cheering. It gave many rides. And at afternoon's end, a thunderstorm rippled down the Potomac Valley, and to safeguard their antique—after all, *John Bull* was the Smithsonian's first big engineering display—the crew raced the rain to the shelter of an underpass. That, too, used to happen 150 years back.

Ancient train halts by ancient C & O Canal, which was doomed by railroads.

Robert Vogel, Curator of Engineering, joins engine crew in proper costume.

Driving mechanism is concealed behind massive wheel. Only rear wheels are powered.

Douglas Evelyn, Deputy Director of
John Bull's museum, poses as passenger.

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throttle and *John Bull*
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Ach Du lieber!"

By Ann Haskell

Modern scholar steps back into medieval times

Life as a 14th-century woman brings grueling chores, fear of omens—but time to think and to rest content

When I open my eyes I can see a sliver of sunshine, the measure of working time already lost. With light so precious, even at midsummer, I hate to waste any of it.

Leaving my daughter asleep, I leap out of bed and dress fast, pulling on a white chemise, a dun-colored skirt over it, and finally a brown bodice, left laced from the night before. I slip my feet into flat shoes, empty the night pail out the window, and begin the ritual of unbarring the door to this grange where we sleep. In now familiar order, I remove the objects that at nightfall I will again fit together to form a barrier, our only protection in this isolated canyon, a deep slice in the French earth.

Crouching, I step through the low door into the cool of an early July morning and reckon the time from the light on the opposite canyon wall—about 7:15. My senses snap to attention and I become alert for what has changed while we have slept. Enjoying the beauty of this wild place, the pleasures of its sounds and smells and feelings, must be postponed until after my inspection.

First I peer beyond the dark doorsills of all the apertures in the rough stone-and-wood buildings—tool sheds, animal shelters, lean-tos—on guard for what might emerge, human or animal. I round the end of the house. A passing lizard and a loose stone in the otherwise smooth patch are all that I see.

Next, I enter the kitchen, really an open-roofed room, where we do most of our summer living. Wood, crockery and iron dishes and pots are stacked on the rocks around the linden tree, where they were left to dry; the wooden washtub is just as it was; the oil lamp of shallow, hollowed-out stone seems no different; and the ashes of the last meal's fire are undisturbed. But on the doorstep, a single slender branch, about two feet long, is dramatically draped, as if placed there precisely, across the wide stone. By whom? Is it an omen, a message, a warning? What does it mean?

Heart pounding, I stand stock still, trying to puzzle it out. I hear a slight noise behind me and wheel around, ready for whatever or whomever I must face. But it is only a berry, the first of dozens that will fall this day. The berries are like my nerves, I realize, snapping unexpectedly.

Previously, we have lived in a small village, but we are testing medieval country life, and I begin to understand firsthand the superstition, the beliefs, the fears, that I have met before only in literature. In the village we lived, literally and figuratively, in the shadow of the castle, and, as in the 14th century, there is protection in that proximity.

A tenuous link to the outside world

Here, where we might have come in time of plague, famine or other danger, we are seven kilometers away and the terrain separating us from the village is rugged indeed. Only a footpath connects our farm to the outside world. With none of the usual backdrop of life—protection, diversion, social interaction—I am like a woman without skin, who laughs and cries and is alarmed too easily. I feel much more deprived socially than materially.

The tension broken, I pry open the heavy kitchen door with a tool I have hidden in the rocks nearby and wash my face in rainwater, collected in a cistern on the roof, then head toward the river for the day's supply of drinking water.

I finally allow myself to enjoy the incredible view upward from this canyon. Tilting my head back, I look at the top of the gorge, wind-whittled through the years into shapes of castles and fists and faces. Down through the millennia, through layers of stone and earth, a tiny river, the Bonheur ("good fortune"), the sprinkling, fast-flowing, trout-filled stream I drink and bathe in, has worked its way through time—Phoenician, Roman, Greek, Spanish, French. Here the distance between 14th and 20th centuries is inches.

To reach the river I walk through a small meadow, knee-high in grasses and pink flowers except for a

The author wades through a field of lavender near Vaison-la-Romaine in southern France.

Photographs by Pierre Boulat

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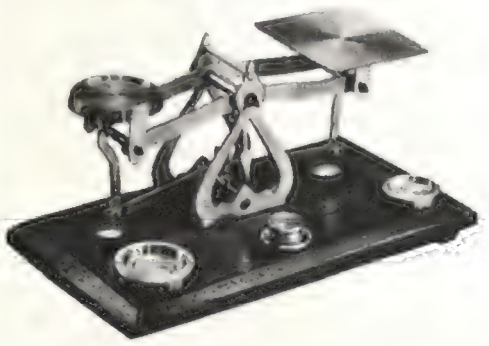

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Village of Le Barroux, shown in wide-angle view, formed author's 14th-century world during winter.

clearing where I am building a sundial. It is populated, too, with hundreds of butterflies which light on me as indiscriminately as on the flowers. And at the stream two waterfalls, one upstream, one down, make an appealing sound. I mean to follow the river, but I never have time.

I watch the pulsing patterns of water skippers skating on the surface of the water, lacy shadows on the floor of the pool I now stand in, moving to the beat of some unheard music, for a moment mesmerizing me. These random bits of diversion are important in a life filled with hard physical labor. Did my medieval counterpart in this place enjoy them too? Were they her music, art, literature?

Today I notice more dragonflies than usual—animated, teal-blue Tiffany glass ornaments that glide close to the banks. I scoop water in my hands and sip. Did some 20th-century camper far upstream throw some modern, lethal pollutant into my 14th-century water? This is one of the few times during the day that I think of the centuries simultaneously. It is curious how rarely I think of the 20th century, how much of the 14th I feel.

I began this activity quite casually, wanting to know how my medieval counterparts lived: what their lives with their husbands and children were like, what they ate and cooked and wore, but especially how they *felt*—without radio, TV, telephone or other links, without blotters for their emotions. From what I taught and what I researched, I had known some of it already, but I needed to find out the rest. I started out in the village, built around a 14th-century castle in the era of the Papal Residence at Avignon; now we are spending the summer in this isolated farm.

I had created a historically possible persona for guidelines. Since I did not want to live with a widow's restrictions in dress and behavior, even though I would be alone, I thought of myself as the wife of a man working in the spice trade, absent for long periods of time. Also, since I could read and write, I became a teacher for children at the castle. The rest of the facts of my real life—my three older sons and young daughter, for example—were easily accommodated

In her 20th-century life, Dr. Haskell is a writer and teaches medieval literature.

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Sundial adorns a village wall. Author told time by sun's angle.

in my fictive one. And each time I returned to the village, it was with still more knowledge of how that middle-class woman would have lived in the late Middle Ages.

My 14th-century life leaves little time for musing. I click back into action, fill the water bucket, dry my feet on a tuft of dark green moss, luxurious as any deep-piled, terry-cloth towel, and start back up the path toward my chores.

I must make a fire to heat water—for clothes, dishes, cooking. We will look for early apples and herbs, and I must mend some clothes and at least look at the sundial, so I can think about it while I work. I have promised my daughter crêpes, and I want to look for the rat's nest in the grange while it's light. Also, I need to put some sort of cover over the window to keep another bat out.

I must think of chores in terms of sequence: how long will it take for the fire to start; when will the water be hot enough; what can I do while I'm waiting; will the same suds accommodate something else? A fire started to boil water can cook tonight's lentils. Coal for tonight's lentils can make tomorrow's applesauce.

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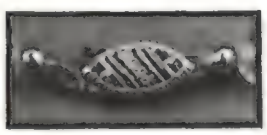

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Some jobs require no schedule. Each day there is firewood and kindling to be gathered, water to be carried up from the river and waste to be burned, tossed or buried. Waste presents a sobering problem to people accustomed to incinerators, flush toilets and garbage disposals.

By 20th-century standards, nothing is ever really clean. Sand and dirt linger in crevices no vacuum will ever reach; grit is omnipresent; scrubbing only redistributes grime. But there is a pleasant absence of clutter: no junk mail, no library returns, no TV schedules, no school rosters, no urgent reminders of things to do. Above all there is no sense of life's tune playing faster than we can dance.

When you reduce your life to Base Zero, you add back soonest what you most require. And for us—my 14-year-old daughter is usually with me—what we most need are such things as music, laughter, drama. Ours was never one of those militantly cheerful families that spontaneously burst into song, as in some Ozzie and Harriet rerun. But we have found ourselves singing every old tune we could recall, rummaging the attics of our minds for carols, camp songs, sea chanties, hymns and hit parade items. We need drama, too. After digesting every recent event from the outside world, we turn to the environment at hand, shifting the scale and cast of characters from people to animals, from the events of Man to those in nature. The discovery of a patch of lavender or thyme takes on the significance of finding a new oil field.

We howl with laughter at the feeblest joke. But also we talk seriously, telling one another the stories of our lives, really listening and being heard, perhaps for the first time.

Having lived medievally in isolation, it is much easier for me to understand medieval belief in the occult, to appreciate the work of exegetes, who unraveled the mysteries of the universe from the clues in nature, the symbolism of events.

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One day I was down in the meadow, clearing newly cut weeds with a wooden-pegged rake, when I saw a moving shadow on the ground. My first thought was that it was a small plane, hence another human being, and without thinking, I obeyed my impulses to hide—a response which, even in retrospect, still amazes me. Running for the cover of nearby trees, I looked back at the house just as a huge, majestic bird, an eagle, poised on the peak of our roof—a sight so overwhelming I thought my heart would burst inside my body! But, unable to appreciate the sight straightforwardly as a rare natural event, I began almost immediately to wonder what it meant.

If the eagle incited feelings of fear and awe, it was matched in intensity by emotions of another kind one afternoon down at the water's edge as I was doing the laundry. Kneeling, I held up my arms to shake out a towel I had just rinsed, when I felt a sensation of delicacy and warmth: a pair of flamboyantly beautiful butterflies, one on each side, had simultaneously landed on the bare skin of my shoulders as if knighting me. My response this time was tears.

Sometimes I ask myself how a wom-

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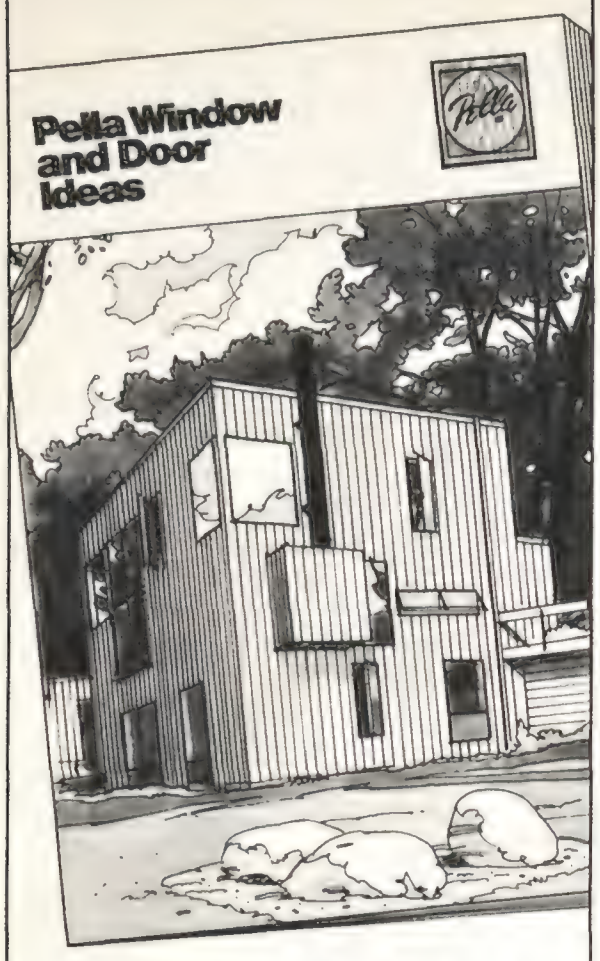

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an from the middle of an American city, accustomed to an overheated, air-conditioned apartment, garbage disposal, color television and phone, taking for granted a car, plumbing and an electric typewriter, ever got to the bottom of a canyon in France, washing her clothes by hand in a river. Usually the question arises out of disgust, when this slash of a canyon is awash with rain that threatens to sweep away everything in its surge toward the river; or when a pothook breaks, literally spilling the beans, killing the fire and reducing dinner to an ashy mess. But it is also engendered by moments of grace and beauty—by sweeping eagles and being knighted by butterflies.

Medieval life revolves around fire and water. Here in the country we carry water constantly. In the village, in winter, access to water is easier—a fountain is in front of the house. But then warmth is more important.

We go back to the village, to the house below the castle, in late October when the sunlight has left the gorge. I am sad not to be outdoors all day, but glad not to be so isolated. Now cold keeps us indoors, and life is more immediate. Medieval winters are to be endured. After such a season, the medieval impulse toward pilgrimage is easier to understand.

In winter, I awake divided into thermal zones: nose frozen, shoulders cold, torso too warm, feet uneven. I rise briskly, sometimes in yesterday's clothes. I shiver down the stairs, cross the icy hall, now a wind tunnel where leaves and bits of straw have been blown in through the cracks.

I kneel on the hearth of our main room, the kitchen, searching in the gray ashes for a live coal, the glowing seed of a fresh fire. I dig carefully, lest in my haste I discourage it, and once discovered I nourish it carefully, adding just enough dried leaves or pine needles to make it grow.

If I have worked quickly, patiently, and am sufficiently lucky, the fire prospers, linking itself to the day just past, preparing itself for the day ahead. Once the fire is certain, the room warmer, I eat and hurry outside, often more inviting than in.

All day I shadow the sun, following it as it shifts from place to place. But before I can leave the house for any extended time I must tend the fire. I

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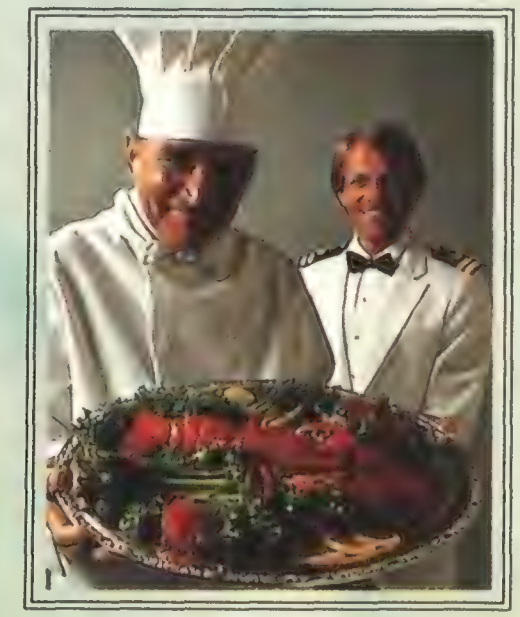

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Author knew a life like that depicted in medieval paintings, in which daily routine was simple but also arduous. At left, a winter meal is served before a blazing hearth. At right, the slaughter of a pig.

feel almost tethered to the fire. Cranky and volatile, it can change my plans without notice.

There are other chores. As in summer, water must be fetched. Now, too, wood must be gathered and brought in to be dried before it can be burned.

I perform such tasks as sewing out-of-doors, settling into some sunny spot that is protected from the wind. My favorite place of all is a terrace up at the castle, where I am sure of finding any sun that may be shining, have the live rock of the castle base behind me as a shield and, best of all, can survey the entire region from a perch that seems on top of the world.

In front of me is the plain that stretches all the way to Avignon, to the Rhône, to Arles and Saint-Rémy. I can see the city of Carpentras, where Petrarch lived as a boy, and Mt. Ventoux, which he climbed as a man, the first Alpinist to write about it. And best of all, I can see the fields, where mostly grapes grow in the summer, tended around the calendar with traditional Labors of the Months, very little changed from the vine tending of the Middle Ages.

I stay up here as long as I can, searching for herbs on the north side of the chateau, admiring the freshly dyed silk—in this area where silk has been produced for hundreds of years—drying above me, looking for rocks to prop up my pots in the fireplace.

As the sun begins to go down, I climb up higher, to stay in its warmth and light as long as possible. I press against the still-warm stones of the chapel steps, out of the wind, watching the daily drama of sunset.

The sun slides down the hill "lady" to our left, a low chain of worn-down mountains whose configuration is that of a reclining woman. But it still touches the top of the dentelles, curious toothlike tips of another ridge, and the snow-capped Ventoux.

Avignon becomes a rusty smudge in the distance, even the Alp loses its glow, and my eyes strain the darkness, looking for the last light. Huge crows crowd one another for niches at the top of the castle, the wind becomes stronger, and before I know it, the world around me is pitch black.

I hurry down the chapel steps, feel my way along the lower wall of the castle, shuddering as a bat flies just over my head. Terrain that is in daytime familiar becomes fearful at night. I pick my way along the cobblestones, going slowly until I hear the fountain by the church. Down one more ruelle, past the gaping blackness that is my stable, around one more corner and I am finally in front of my own door.

Inside the house I feel secure. The temperature has risen dramatically during the day: thick stone floors and

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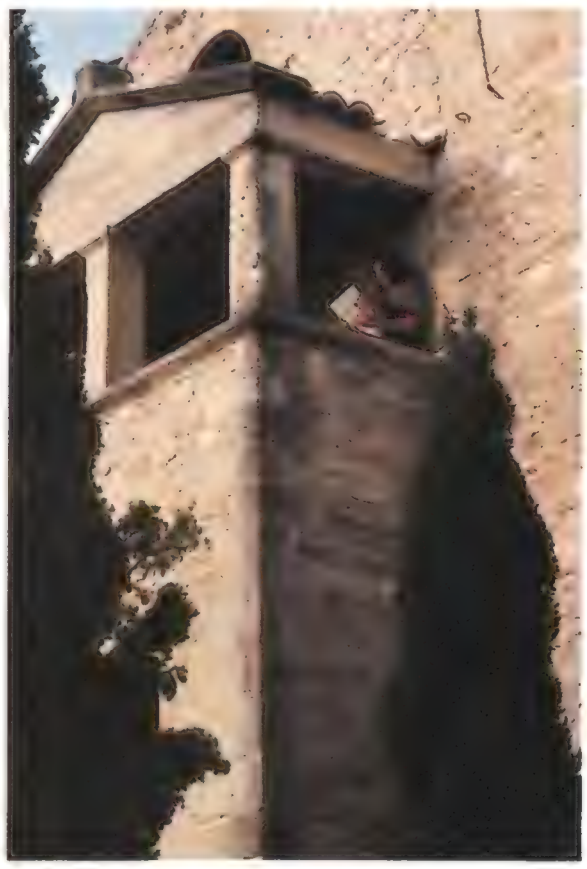
walls, icy on winter mornings before the fire is lit, have become warm by evening. This stone, which in summer keeps the house as cool as if it were air-conditioned, now radiates heat, and home takes on renewed meaning. It offers light, comfort, safety. Sitting on the wide hearth, satin smooth from years of January cold feet, the contentment of this moment would be hard to surpass.

Winter mornings are sober, cold, lit with thin sun that gives no warmth and little cheer. After the fire is fed, I eat breakfast, exactly what its name implies, a meal to arrest hunger. Typically, it consists of cheese, bread, apricot preserves and cider. Shivering and rumpled, I sometimes recall the pleasure of a 20th-century shower, but the thought of chill, bare, wet skin quickly vanquishes the idea. Winter bathing is for nighttime, bit by bit, in front of the warmest of fires.

In the village, there are two constant reminders of time, both, in fact, perpetual since the Middle Ages—the bells that ring every half hour and the weekly market, whose license dates back through the centuries. Ex-



From such towers and galleries, author cherished the winter sun.

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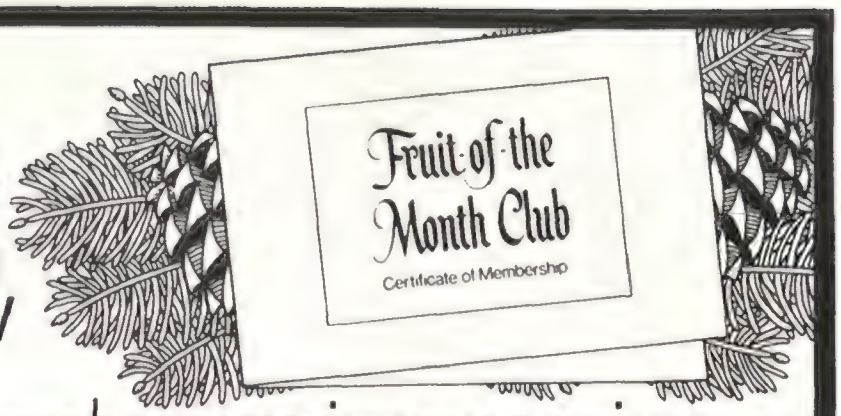

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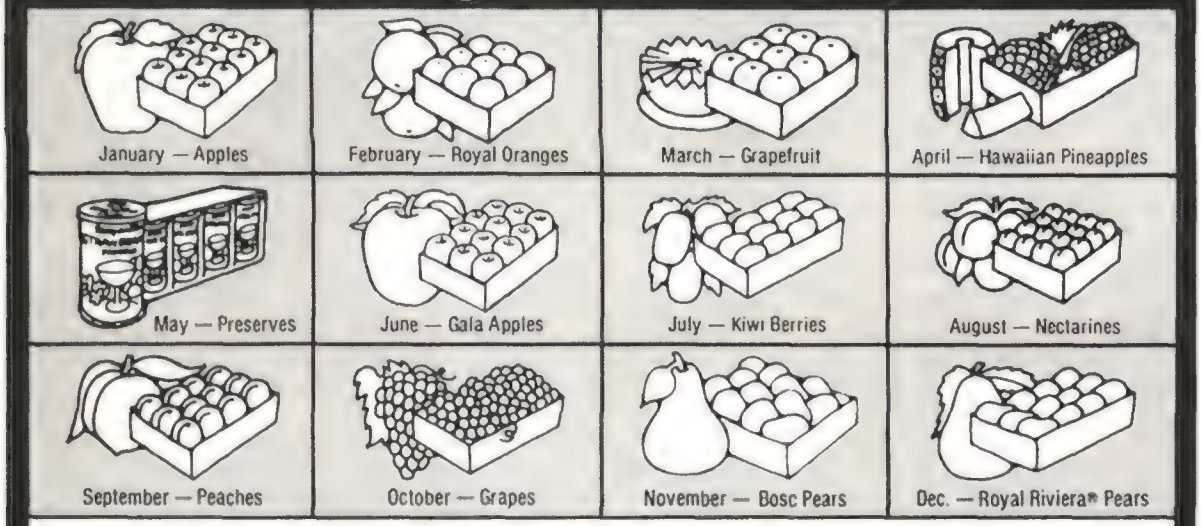

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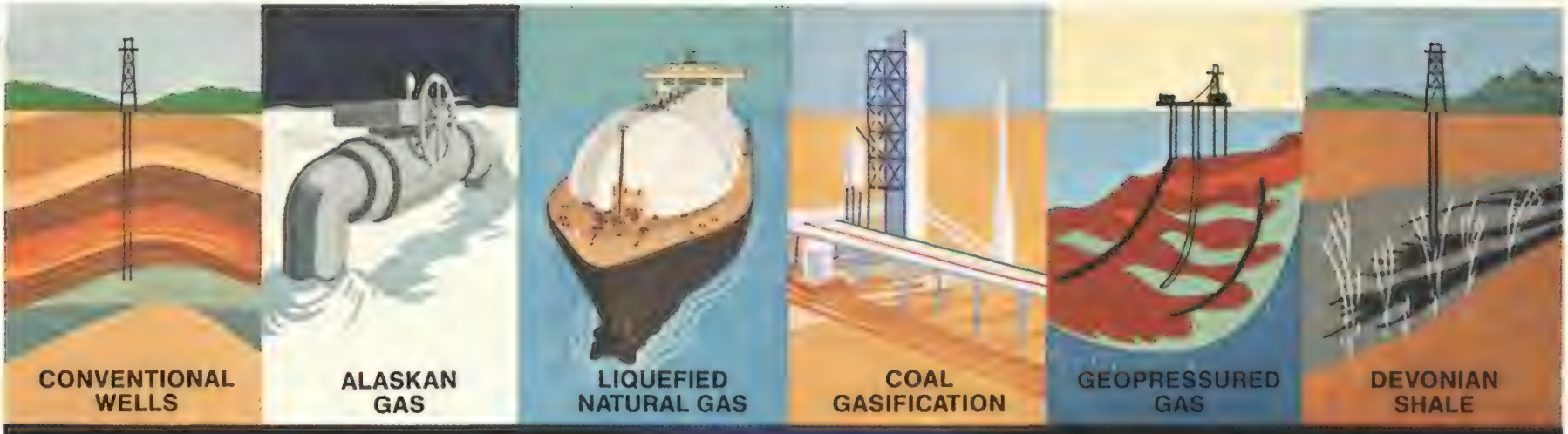
In the same way and in the same place as in the Middle Ages, farmers and itinerant merchants set up stalls, selling everything from food—geese, rabbits, quail, fruit, cheese, olives and pepper—to pardons. (A replica of Lourdes is pulled around to the markets. Onlookers contribute, both for their and the shrine's benefit.)

Cobblers make shoes to order. Stalls sell cloth and pots and pans. The sum total of it all looks remarkably like pictures of medieval markets.

Except for tomatoes and potatoes, which were introduced from the New World much later, my daughter and I eat almost all of the food produced in the region in medieval times—marvelous apricots and grapes, cheeses, herbs, fish and wines. The difference is in the juxtaposition of foods. Mincemeat and plum pudding might be served along with fish or fowl that has, in turn, been prepared with pepper and sugar and cinnamon.

We eat simply and well, and feel very healthy. Though our lips are



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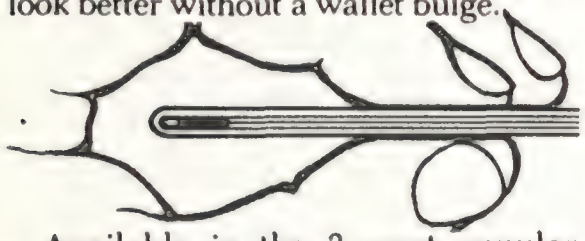

Available in the 3 most popular styles, all have window cases for 16 or more credit cards. You can try an Oxford Nylon wallet with the understanding it can be returned within 31 days for full refund. The wallets are sold regularly (since 1973) through the Wall Street Journal. Three year guarantee. Great gifts for friends and associates. Give yourself a 10% discount when ordering 3 or more. Send the coupon or equivalent information to:

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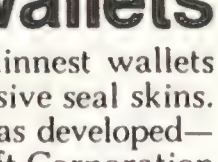
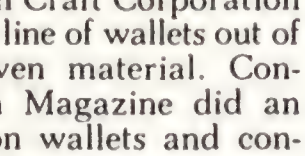
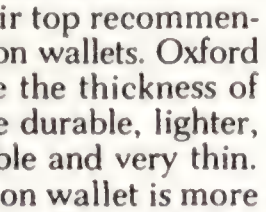


Classic—Thinnest hip pocket wallet with a section for money and notes plus two hidden compartments. 10^{00}



Executive—Coat or hip wallet with a handy stacking rack for credit cards and a 3½x5 picture window. Two hidden compartments. 12^{00}



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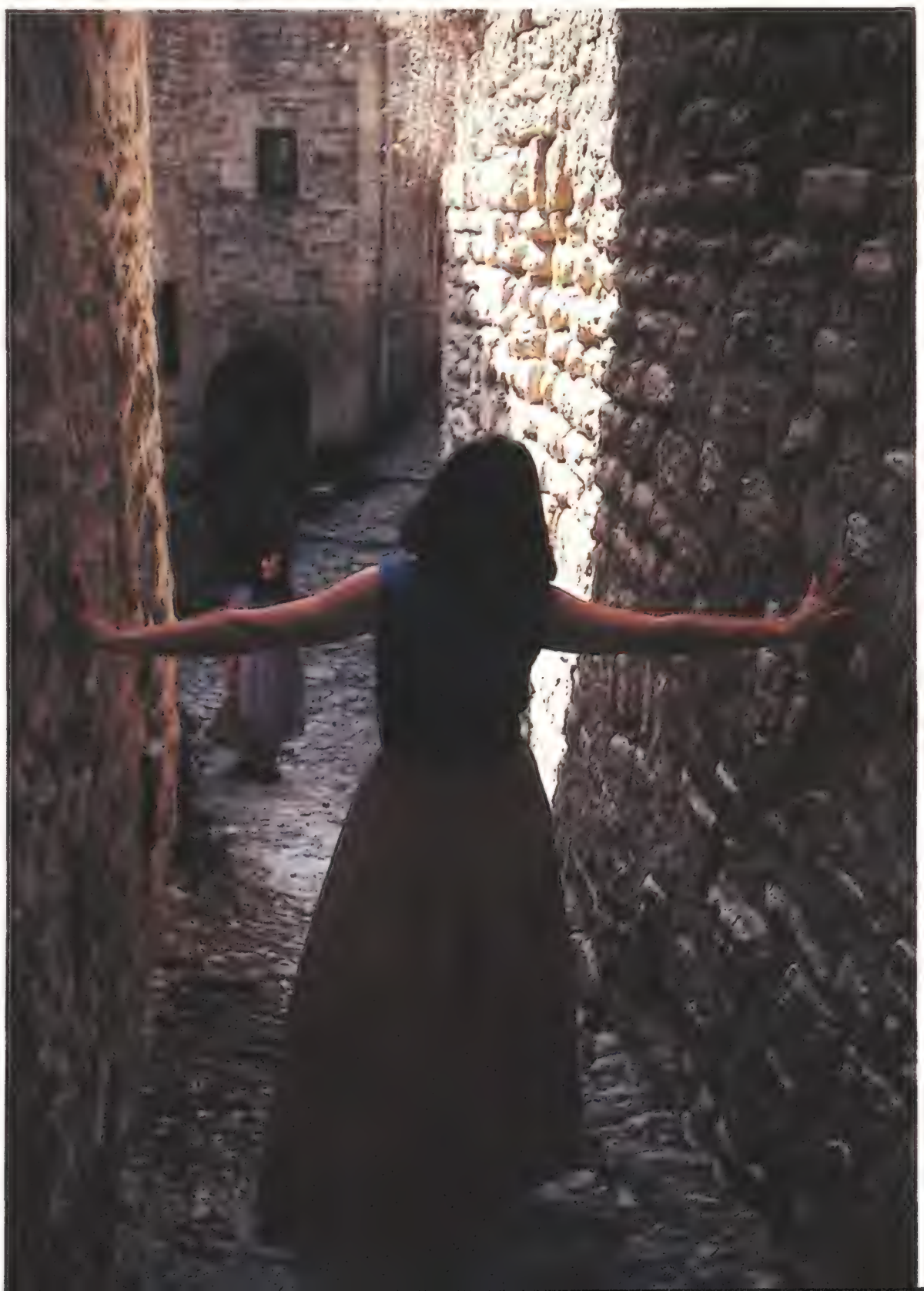
Spanning a medieval street in Le Crestet, Mrs. Haskell greets her 14-year-old daughter, Gretl.



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Dandling a Teddy bear on his knee, Gotelli sits before Santa graphics.

By Kenneth Turan

He decks his halls (walls, too) for a Christmas jolly

Dolph Gotelli collects, exhibits vast stores of Yuletide memorabilia in fantasy-filled Victorian house

Beneath a turn-of-the-century Christmas tree laden with paper ornaments, a bear and guest have a party with a period china tea set.

It all started for Dolph Gotelli when he was six years old: "One of my first memories is going to the five-and-dime with my mother and pleading with her to buy me a Santa made in occupied Japan in the late 1940s or the early '50s." Some 35 years later, Gotelli (above) still has that galoshes-wearing Santa with a decidedly Oriental twinkle in its eyes. And that Santa has a lot of company.

Gotelli, a slight, slightly nervous man, leads the way to a quiet alcove in his northern California Victorian home. "This," he announces, "is my Santa blitz." He is not kidding. Santas grinning, Santas chortling, Santas sleeping, Santas looking worried, tens and tens of dozens of Santas packed together like an especially jolly subway rush-hour crowd. My mind reels, but Gotelli remains calm. "This is stuff from the 1920s to the 1940s that most new collectors would love," he explains, "but I try to find earlier Santas." The implication is unspoken but clear: he is not like most Santa collectors. In his house, that kind of material barely makes it out of storage.

And it is a whole house we're talking about—eight spacious rooms—that Gotelli bought five years ago specifically for his astonishing collection

Photographs by Christopher Springmann

Gotelli designed and assembled a seven-foot-long fantasy village (only a portion shows here), then encased it in glass.

of thousands upon thousands of pieces of Christmas memorabilia. His finds fill every corner and every wall; every room is awash with the appropriate ephemera. The kitchen has Santa candy containers, chocolate molds and bisque cake decorations. The study overflows with Christmas-related folk art. Even the bathroom has a vintage advertisement of Santa washing his hands with Pears' soap. "You could say I live in a museum," Gotelli suggests, and no one is about to argue. "My existence, all my interests have merged into one." Christmas is not his collection, it is his life.

What sold him on this particular house, for instance, was the 30-foot-high glass-domed rotunda that accommodates his penchant for oversize trees like the 14-foot Christmas fir that he has decorated exactly as it was done in the early 1900s (p. 186). The branches burst with paper lanterns, paper cutouts, 20 different kinds of tin candleholders, plus numerous miniature dolls, animals, birds, horns, cornucopias, nut holders and more.

What holds true for the tree holds true for the house as a whole: it takes hours for the eye to adjust to the multiplicity it contains. The more you walk around, the more things you notice, and the more you admire the exceptional fastidiousness and taste that Gotelli, an associate professor of design at the University of California at Davis, brings to it all. "I'm familiar with every object. If something is moved—just one item, one small bear—I notice," he boasts. "Even people like curators who are involved with objects find that mind-boggling."

His collection comprises all aspects of Christmas, but a special fondness for old Mr. Claus runs through it. "He's the most important folklore figure in America, but as each Christmas goes by, his appearances diminish in number. There are fewer and fewer Santas in the stores," Gotelli maintains. "I want to keep him alive."

In the course of collecting, Gotelli has become an expert on Santa, a gentleman who started life in Asia Minor as one Nicholas of Myra, a fourth-century bishop and friend to children, who was credited, among other miracles, with restoring to life three students who were murdered and pickled in a vat of brine by a particularly nasty innkeeper (for more about the bishop, see "Points of Origin," p. 42). In his 18th- and 19th-century incarnations as Saint Nicholas, also known as Father Christmas, he looked bizarre by modern standards. His clothing could be green or yellow or brown or blue, his demeanor severe, his figure as gaunt as a martyr's, his beard as scraggly as a Hasidic sage's. Gotelli has a number of these early Santas in his collection and their presence is anything but cheery (p. 180).

As to the jolly, rotund, red-suited citizen we know today, he is largely a product of three men. The first was

The film critic and book editor of California Magazine, *Mr. Turan writes from his Los Angeles home.*

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A not-so-ho-ho German Santa from 1880s doubles as candy container.

Somber Father Christmas from 1880s England carries sweets in his pack basket.

Clement C. Moore who, in his 1822 "A Visit from St. Nicholas," described the visitor as "a right jolly old elf," possessed of that famous "little round belly/ That shook, when he laughed, like a bowl full of jelly." Then came cartoonist Thomas Nast, the man who made "Boss" Tweed cry, and who popularized the visual version of Moore's elf, and, finally, Haddon Sundblom who brought him up to date with the familiar Coca-Cola Santas in the 1930s.

While some collectors keep their hoards hidden from public view—"I have friends who won't show a thing; they have everything locked up in trunks"—Gotelli's professional background in exhibition design (including shows for Sacramento's Crocker Art Museum, the American Craft Museum in Manhattan and the Chevron Gallery in San Francisco, where his exhibit, "The Magic Santa Claus," may be seen until January 8), pushes him in the opposite direction of putting as much of his collection on view as possible. He regularly opens his house to organized tours of doll clubs, antique dealers and similar groups, enhancing the experience with tapes of tinkly music boxes and a special cinnamon-and-spice Christmas concoction that he brews in his kitchen.

Gotelli doesn't just display his collection: he wants to make the viewing of it a completely engrossing experience. He creates a total environment, organizing everything around changing themes such as a children's fantasyland, where he makes extensive use of nursery and fairy-tale figures. Currently, his show is a Victorian Christmas and the pièce de résistance is a parlor that its regal namesake might well have envied.

He borrowed the furniture from antique dealers, put a new lighting fixture on the ceiling and lace on the windows and, in his own words, "stage set" his front parlor to make it look uncompromisingly Victorian. He has placed a wealth of period items on that stage, including goose-feather trees hung with handblown glass birds, fireplace stockings stuffed with goodies, a "ring the nose of Santa" game, a turn-of-the-century Santa-shaped crème de menthe bottle with the original label and, best of all, a four-foot-tall Santa complete with a sack overflowing with toys. On a small table lies a note painstakingly handwritten: "Dearest Santa, A cup of tea and a biscuit for you. Happy Christmas with love, Clara." Is the note as authentic as everything else? Gotelli smiles. "What's real?" he responds. "What's not real?"

Angry Santa (who stole his ski poles?) was created in Germany about 1900.

What Gotelli, who likes to say "I'm 12 years old" when asked his age, has succeeded in doing with the parlor and with his whole house is to blur the lines between fantasy and reality, creating the ultimate dream world of childhood make-believe that everyone wished for but no one ever had.

"I believe we all need the element of play and fantasy in our lives, the childlike approach to the magic of Christmas," Gotelli says. "But as we get older we can't retain this. We lose our holiday spirit; Christmas becomes a time of anxiety. So I've tried to create an environment where you can recapture that spirit. The holiday means to me what it did to—was it Dickens?—when he said, 'There is no better time than Christmas for adults to be children.' "

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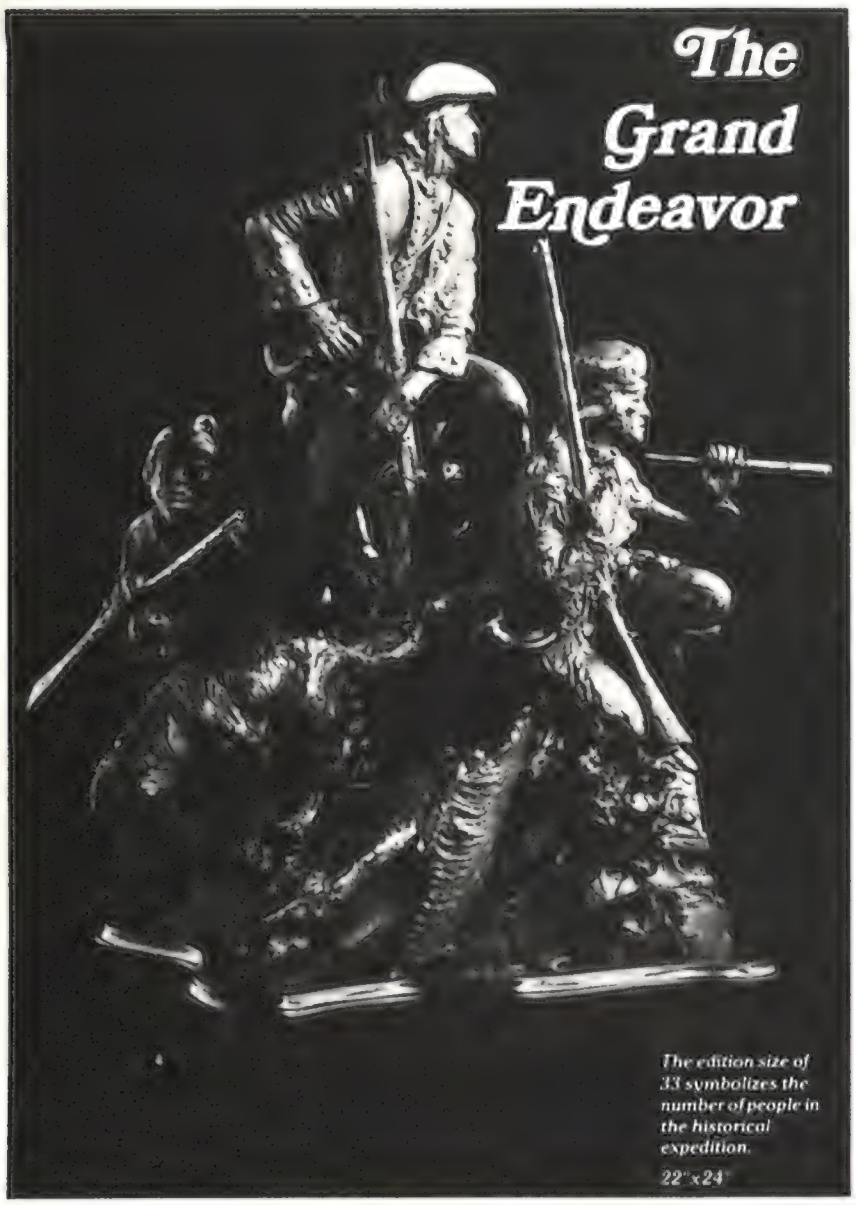

(Lewis, Clark & Drouillard)

The dynamic sculpture by Lorenzo E. Ghiglieri was especially created to commemorate the 175th anniversary of the Lewis and Clark expedition's return to St. Louis, Missouri. It is currently on display at the Missouri Historical Society and in the president's office at Lewis and Clark College, Portland, Oregon.

Lorenzo's extraordinary sculpture was unveiled jointly in St. Louis on September 23, 1981, with the United States Postal Issue of the Lewis and Clark commemorative postcard. Also, purchasers will receive the first-day cover containing the Lewis and Clark commemorative postcard mounted in a framable card holder.

Lorenzo Ghiglieri, Inc.
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And indeed it is adults more than toddlers ("they're just overwhelmed by it, it's too much for them") who respond best to Gotelli's collection. "The impact of *so much*, the presentation of it—it's an irresistible experience," he says. "The men come in with their wives thinking they're not going to be interested, but they end up acting just like children. I can't tell you how many people have come in and told me, 'I was depressed about Christmas until I saw this.' "

What Gotelli doesn't like to hear, because it indicates a lack of pure enjoyment, are "people who come in and the first thing they say is 'Where do you store all this stuff?' " But in fact Gotelli couldn't do what he does without a filing system comprehensive enough for the Library of Congress. As soon as a new item comes in it is immediately numbered and catalogued in one of 25 categories and subcategories and stored in color-coded boxes—red for Santas, purple for ornaments, black for prints, and so forth.

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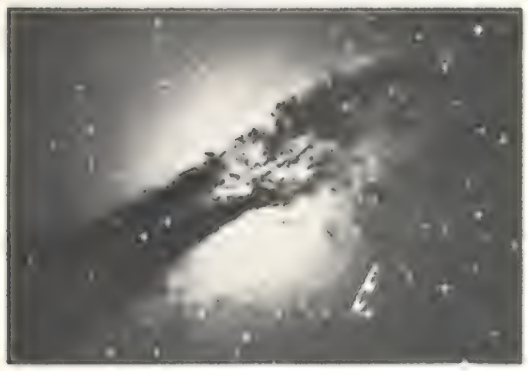

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Even as a child, he had a desire to decorate: "Inside the house, my father put limits on what I could move. I couldn't move his chair, for instance, but I'd design and build amusement parks in the yard and elaborate lawn displays of Santa fishing, elves skating —things like that." His Santa collecting began in earnest when he started college, intrigued in part because "all Christmas stuff was made for temporary usage. It was usually thrown away by adults or destroyed by children. It's amazing any of it survives." If it *has* survived, Gotelli likely will run across it. No matter what city, state or country he may be in, he spends every weekend going through thrift shops, antique stores and flea markets searching for Santas. He found what is probably his favorite piece, a German windup mechanical Santa circa 1880 (p. 182), known as a 'nodder' because of the motion of its head, as a result of his habit of "always seeking out small, obscure toy and doll museums. I found one on the outskirts of London. It took me 45 minutes to reach it by bus on a rainy day. The only person there was the woman who ran the place. She told me she'd just lost her lease and was willing to sell some things. Way up in a high case I saw this piece. It was like a dream come true."

Occupants of this dollhouse are from Beatrix Potter's animal tales.

Although he has his share of peeves ("I don't like anything that looks really plastic and I detest bread-dough ornaments—they're too heavy and they've been worked into the ground"), Gotelli's collection is remarkably catholic, ranging from present-day items back to a painted Viennese wine bottle that dates from the early 1800s, and he looks for the same elements in every object he buys. "There is a certain face, a certain attitude that you can relate to, that intrigues you enough to look a second time," is how he explains it. "It's an appealing quality, like looking at a human being."

During his collecting odysseys, human beings have in fact become more of a challenge than Santas. "I can't go anywhere where collectors are without being recognized," he complains. "I was at a small flea market in upstate New York and six or seven people came up to me and said, 'You're Dolph Gotelli, the Christmas collector.' It's become a problem; people think I'm a millionaire and I get offered things at giant prices I can't afford. When I started I didn't know anyone else who was collecting. Now there are so many Santa people we get together and have Santa Summits." Some people do it for investment, he maintains, but others do it for love.

Although he has cut back his activ-

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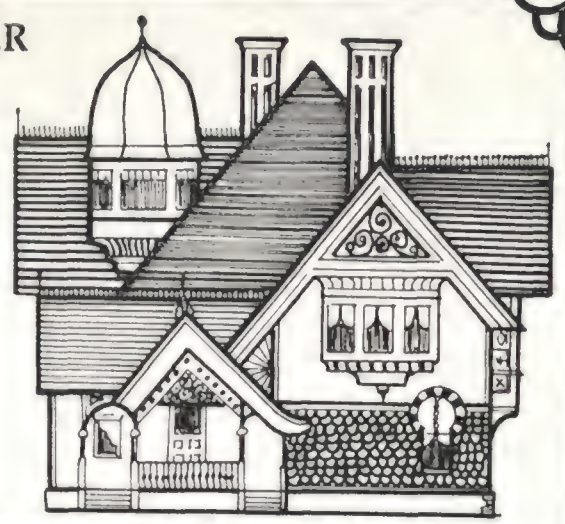

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ities to the extent of mounting his shows every other year instead of annually, Gotelli admits "I'm in a position where I can't stop." His dream is to turn his house into a foundation-funded, nonprofit Christmas museum so that his collection can be on permanent display, not hidden away in storerooms as it probably will be if he donates it to a major institution.

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Book reviews

Waldo Emerson
Gay Wilson Allen
Viking Press, $25

In the early 19th century, many New Englanders began to reject conventional religious orthodoxies, insisting each man had a God-given pipeline to divine truth in his own conscience. In Ralph Waldo Emerson such rebellion against dogmatic complacencies produced an extraordinary thinker, author and lecturer who became "the strongest moral and literary personality of his generation."

Precisely how the shy, inhibited young son of a prominent Boston minister was transformed, after years of inner religious turmoil, into the most fiercely individualistic and most popular lecturer of his time is the subject of Gay Wilson Allen's exhaustive and monumental biography. Based on a thorough reading of earlier scholarship and Emerson's many writings, including newly available letters, *Waldo Emerson* is at once a detailed study of the Sage of Concord's thought and an absorbing, well-crafted narrative of his life.

To the early despair of his father (who died at 42, when Waldo was only eight, leaving six children and a wife, who soon took in boarders), Emerson seemed a serious-minded but unpromising youth. At 14, however, he entered Harvard, and despite a mediocre record there began to read voraciously, to display a greater "maturity of mind," and to evince a penchant for journal keeping.

Like many other young intellectuals of that era, he became a minister, work for which he was remarkably unsuited both by temperament (he was impatient, self-conscious and could not abide small talk) and conviction (his "emerging intellectual and moral independence" clashed directly with Puritan orthodoxies). Before long, as Allen makes clear, he grew so dissatisfied with institutional creeds—all seemed irrelevant to the individual's quest for union with his spiritual sources—that his break with organized religion became inevitable.

In 1832, he left the ministry, toured Europe (where he began his lifelong friendship with Thomas Carlyle), and returned to launch an energetic career as an itinerant lecturer ("a literary runner & Lyceum Express," he called himself) determined to "agitate men, being agitated myself." Whether lecturing on nature and science, on American literary and intellectual life, or on the social and political issues confronting a nation on the brink of the Civil War, Emerson taught, he said, "one doctrine, namely, the infinitude of the private man."

Drawing heavily on Emerson's jour-

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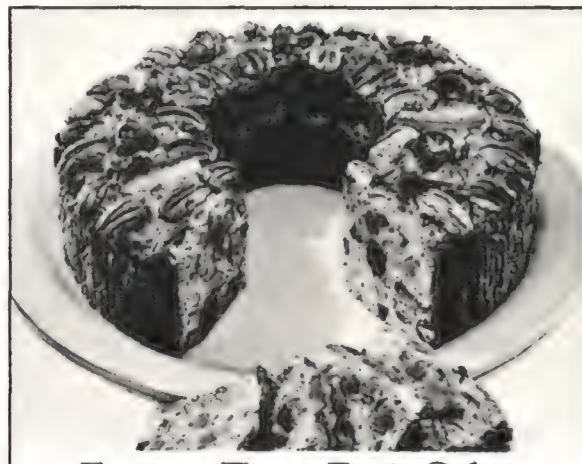

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nals, Allen traces at length the complex and often paradoxical ideas of the man who sought to explain the "divine impulse" at the core of Man's being. His lectures and essays, we learn, were the outgrowth not only of wide-ranging reading, particularly among the works of Neoplatonic thinkers, but of exchanges with close friends (including Thoreau, Bronson Alcott and others with whom he founded *The Dial* and the Transcendental Club) and the overheard conversations of workmen in Boston's North End. Such exchanges often anticipated modern thought, from the Big Bang theory of the universe to the psychological insights of Freud and Jung.

While examining Emerson's essays, poems and other works, the author skillfully sustains his narrative of the writer's family life, which was marked by sufficient illness and tragedy (including the deaths of his first wife and a son) to overcome many men. In Emerson, whose character was his strength, such misfortunes were met with stoic indifference: "I could never give much reality to evil & pain," he wrote at 57, on the eve of his most demanding years as a lecturer.

Though he might well have seized the opportunity, no college would have the highly critical Emerson as a faculty member. So he forged a livelihood as a professional lecturer, often holding forth on the abstractions of mysticism, but more often in later years on the practical concerns—farming, domestic life and the right use of books—of audiences throughout the country.

Ultimately, says Allen, he demands our attention as a brilliant essayist who, like Mark Twain in fiction, captured "the rhythms, vocabulary and inventiveness of American speech," in "Self-Reliance" and other nonfiction pieces. Many readers will doubtless turn again to those classic works after finishing this splendid life.

Joseph Barbato
New York critic and columnist

Practicing History
Barbara W. Tuchman
Knopf, $16.50

Barbara Tuchman's books cover an astonishing range of space, time and cultures. She appears to be as at home in 14th-century Europe (*A Distant Mirror*) as she is in 20th-century Asia (*Stilwell and the American Experience in China*); and a string of best sellers, stretching back to *The Zimmermann Telegram* (1958), has made her perhaps the best-known American historian of our day.

Practicing History contains Tuchman's reflections on her craft, along with book reviews, reportage and other occasional pieces written since the mid-1930s.

In the long debate as to whether history is an art or a science, she comes down in favor of art, and is pleased to think of herself as mainly an artist, a "professional writer" (who nonetheless always works from the facts) as opposed to a "professional historian," the sort of creature who bores one captive audience after another, from the dissertation to the grave.

Unfortunately, beyond insisting that a historian is (or should be) mainly a storyteller and artist, about the craft of history Tuchman has little to say. Her essays on the subject, witty and graceful as they are, tend to be disquisitions on How I Wrote *The Guns of August* or *The Proud Tower*—repetitious and self-congratulatory.

She can hardly be blamed for identifying history with what she does best, for she is herself a superb storyteller, so accomplished that she can make her readers forget how a story as familiar as the outbreak of World War I will come out.

But great storytellers don't always make great essayists. Many of Tuchman's occasional pieces, however well suited they may have been to the occasions that prompted them, haven't held up well. (One exception is her dissection of Henry Kissinger's memoirs.) Her several essays on Vietnam and Watergate, for example —liberal, urbane, humane and predictable—seem dated, for the most part; they aren't likely to be included in anthologies compiled from the avalanche of writings those episodes unloosed. Her essay on the Six-Day War, however shrewd its assessment of how the Israelis won what has been termed the most brilliant military victory of modern times, subscribes to some embarrassing Arab stereotypes.

Perhaps the best essay in the collection, "If Mao Had Come to Washington," first published in *Foreign Affairs* in 1972, reverts to the kind of writing Tuchman does best. In considering an event that ultimately didn't happen—a proposed encounter between the Chinese revolutionary and Franklin D. Roosevelt—she illuminates one of American foreign policy's most far-reaching recent failures.

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Haband's EXECUTIVE DIVISION

Barbara Tuchman isn't as lonely as a storyteller as she may think. For many academic historians, the bloom has gone off the quantitative rose; the romance has gone out of social history. No less a figure than Princeton's Lawrence Stone, one of the most well-regarded and influential historians in the West today, has rediscovered narrative. In *Past and Present*, most rigorous of scholarly journals, he pronounces the practice and its practitioners respectable once more. (He would like them to know a little social history.)

Not all academic historians would agree that "history is not law-abiding or orderly and will often respond to a breeze as carelessly as a leaf upon a lake." But most of them would think that Barbara Tuchman had written a lovely sentence.

John Talbott
U.S. Naval War College

Fading Feast; A Compendium of Disappearing American Regional Foods
Raymond Sokolov
Farrar, Straus & Giroux, $17.95

In his introduction to *Fading Feast*, Raymond Sokolov ruefully recalls the argument advanced by his high school debating team in 1957 as a clever ploy: American agriculture would be saved if agribusiness were to supplant the small farmer. Sokolov says ". . . we never thought it would actually come to pass. Or that the decimation of the country's rural populace would bring with it such terrible consequences. . . ."

The resulting "social disruption on a vast and ghastly scale as well as an unspeakable degradation of food quality" are, according to the author, irreversible, "barring the advent of a totalitarian government on the order of the Khmer Rouge. . . ." Thus, this record of the comparatively few specialties that remain in regional larders acknowledges the inevitability of their eventual disappearance from American life. But then, writing more sadly than angrily, more wittily than shrilly, more anecdotally than polemically, Sokolov offers some possibility for slowing down an inexorable process.

The 24 elegantly researched, passionate and literate essays that make up this book were, with Adelaide De Menil's photographs, originally published in *Natural History* magazine. The author approached his researches as though they were field trips, identifying regional foods –such as native persimmons, wild rice, gooseberries, morels, black walnuts, abalone, Pacific salmon–at risk, and the enemies that threaten whatever standards, variety or individuality that remain. These forces include simultaneously frustrating, stupid, necessary or even helpful government regulations, environmental onslaughts, ignorance, avarice, sloth and general idiocy, although not necessarily all of these or in that order.

One chapter describes the defeat of the delectable Olympia oyster by the larger and boring Pacific oyster, which grows faster, requires less intensive labor and earns more money. Another is devoted to the imminent extinction of the Maine lowbush-blueberry industry, which has the misfortune to be based on a better-tasting berry that doesn't pack or ship as well as its dull highbush counterpart. Another tells of a sad and almost fruitless search for key limes in Florida, where orchards that used to produce that delectable citrus product have been replaced with trees that bear larger, tough-skinned, seedless, more easily shipped and inferior Persian limes.

Progress and rising costs have also taken their toll on other regional foods. Tillamook cheddar cheese, which used to be one of Oregon's leading cottage-industry products, had traditionally been aged for two or more years to produce an outstanding cheese. Now it is manufactured in a stainless-steel factory and sold within three to seven months. The cost of holding the cheese in storage is prohibitive, and anyhow the demand for the mediocre product is still great.

Government regulations designed to protect the public health and the environment also restrict the availability of many regional foods. Home-cured Smithfield hams cannot be sold, practically speaking, outside the state of Virginia. Because shot game can't be sold, Brunswick stew may not appear on a restaurant menu if it contains squirrel meat, the ingredient that distinguishes the original stew. Boudin noir has virtually disappeared in parts of Cajun Louisiana because of the cost and complexity of collecting animal blood in compliance with the law. Geese are overpriced and underutilized because, among other reasons, they are subjected to the same plucking regulations as chickens.

This would have been a dismal litany had Sokolov not relieved it with humor,

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compassion and even some optimism. His descriptions of the people who still cook regional dishes are charming and, since he makes his readers want to taste them, sad since most of the dishes are cooked for families and are not available commercially. Then he includes more than 100 of the recipes he has collected on his trips to whet the appetite and encourage a yearning for these foods. He is also generous with information on where and when they can be found.

Sokolov cites the Michelin guide's recommendation for good provincial restaurants—*"Vaut le voyage"*—to encourage his readers to set forth and discover for themselves the flavors of these fading feasts. The trips that this book takes us on are themselves well worth the journey.

Judith Huxley
Food and cooking columnist
Washington Post

Life Itself
Francis Crick
Simon & Schuster, $12.95

A spaceship from a distant planet descends on the lifeless Earth carrying a precious microorganism cargo. In such a way was life on Earth begun, at least according to a scenario called Directed Panspermia (literally, "seeds everywhere"). The concept was first forwarded by J. B. S. Haldane in 1954 but its champion is not Immanuel Velikovsky nor Erich Von Daniken but Francis Crick, winner of the 1962 Nobel Prize for Medicine.

As one of the code-breakers of the DNA double helix, Crick is eminently qualified to discourse on the necessary ingredients for the "primal soup" in which the first replicating nucleic acids must have simmered. He demonstrates in *Life Itself* that his knowledge extends from the microscopic to the farthest reaches of cosmology and astrophysics. In the first half of this slim treatise, he ranges across this huge micro-macro field to review in entertaining and accessible fashion what is now known or generally accepted about the origins of the universe, and specifically Earth and the composition of its creatures.

For Crick the crux of the creation dilemma is how the necessary constituents of life (a soup that his colleague Leslie Orgel says would indeed have as much organic matter as clear, thin chicken bouillon) could have been mixed in the oxidizing atmosphere of Earth. A reducing atmosphere (more hydrogen, less oxygen) would have been more favorable.

At this critical juncture, where fact and scientific theory beg off, Crick presses on. He combs the galaxy in search of the right soup starter. Of its hundred billion stars he estimates one in a hundred would have the right size and structure to support such a planet. One in ten of these solar systems might have the right conformation; and one in a hundred again, a planet of suitable size for life bearing. In all, Crick's winnowing leaves him a million potential seed planets at an average spacing of a hundred light years. Radiation would have killed off any life-forms launched toward our planet by natural events. So Crick concludes the seeding of Earth must have been the deliberate act of a higher intelligence.

Life on Earth, it is now thought, took nearly four billion years to evolve to its present form, and the universe is thought to be 11 billion years old. Time enough, says Crick, for one civilization to evolve and start the same chain on the as yet lifeless Earth.

All right, he's got suspects; planets in the right place at the right time. What about the weapon? Bacteria is the ideal payload to Professor Crick: lightweight, capable of surviving long-term freezing, radiation and shock of reproducing in adversity and isolation. His case is on shakiest ground when he attempts to ascribe motives. Perhaps the Johnny Appleseed civilization was crumbling, facing catastrophe, planning long-term expansion, or eager to move on, but unable to transport more complicated life-forms.

Perhaps. The weight of so many uses of "perhaps," "one has a feeling," and "probably" makes Crick's speculation as sturdy as a house of cards. At least there is not a joker in the deck, as each of his assumptions and imaginings is based on the best available science.

Crick has anticipated criticism of *Life Itself* as science fiction (his own wife calls it that) and pedestrian fantasy at that. As sci-fi this would be less than daring, but Crick has attempted to find an answer for the creation of life that is within the reach of our own technology. As such it is as "valid but premature" (as the author admits) as any informed speculation on our origins might be—and a delightful fishing expedition.

Don Lessem
Boston critic and naturalist

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Additional reading

Commercial sail (p. 50)

The American Fishing Schooners, 1825-1935 by Howard I. Chapelle, W. W. Norton, 1973

Merchant Sail by William Armstrong Fairburn (six volumes), Fairburn Marine Educational Foundation (Center Lovell, Maine), 1945-55

Minnesota Zoo (p. 62)

Zoo Album, Minnesota Zoological Garden (Apple Valley, Minnesota), 1978

"The Tropics in Minnesota" by Jo Anne Ray, *Minnesota Horticulturist,* January 1979

The Fall of the Wild, the Rise of the Zoo by Robert Bendiner, Dutton, 1981

The Stationary Ark by Gerald M. Durrell, Simon and Schuster, 1976

Animals and Architecture by David Hancock, Praeger, 1971

Naples (p. 74)

The Golden Age of Naples: Art and Civilization Under the Bourbons 1734-1805, The Detroit Institute of Arts with The Art Institute of Chicago (catalog), 1981

The Bourbons of Naples (1734-1825) by Harold Acton, Barnes & Noble, 1956

Mormon Genealogical Library (p. 86)

Genealogical Research: Methods and Sources, American Society of Genealogists, Vol. I edited by Milton Rubincam, 1960; Vol. II edited by Kenn Stryker-Rodda, 1971; Genealogical Publishing Co. (Baltimore)

The Researcher's Guide to American Genealogy by Val D. Greenwood, Genealogical Publishing Co. (Baltimore), 1973

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Tracing your Ancestry by F. Wilber Helmbold, Oxmoor House (Birmingham, Alabama), 1976

Evolution (p. 99)

Life on Earth by David Attenborough, Little, Brown, 1979

A New Look at the Dinosaurs by Alan Charig, Mayflower Books, 1979

Vertebrate History: Problems in Evolution by Barbara J. Stahl, McGraw-Hill, 1974

Khubilai Khan (p. 118)

Ghenko: The Mongol Invasion of Japan by Nakaba Yamada (reprint of 1916 edition), University Publications of America (Washington, D.C.), 1979

Moko Shurai Ekotoba (The Scroll of the Mongol Invasion), Vol. 14 of *Nihon Emaki Taise*, edited by Shigemi Komatsu, Chuo Koron Sha (Tokyo), 1978

"The Mongol Invasions and the Kamakura Bakufu" by Kyotsu Hori; PhD dissertation, Columbia University, 1967; University Microfilms 67-14051

Vacuum (p. 142)

"Cosmic Asymmetry Between Matter and Antimatter" by Frank Wilczek, *Scientific American*, December 1980

John Bull (p. 151)

The John Bull: 150 Years of a Locomotive by John H. White, Smithsonian, 1981

American Locomotives 1830-1880 by John H. White, Johns Hopkins University Press, 1968

Medieval Woman (p. 156)

The Goodman of Paris, edited by G. G. Coulton and Eileen Power, George Routledge & Sons, Ltd. (London), 1928

Fabulous Feasts; Medieval Cookery and Ceremony by Madeleine P. Cosman, Braziller, 1976

Chaucer and his World by Derek Brewer, Dodd, Mead, 1978

Victorian Christmas (p. 177)

The Christmas Tree Book (The History of the Christmas Tree and Antique Christmas Tree Ornaments) by Phillip V. Snyder, Viking Press, 1976

The Santa Claus Book by E. Willis Jones, Walker (New York), 1976

Paris Tower (p. 208)

The Tallest Tower by Joseph Harriss, Houghton Mifflin, 1975

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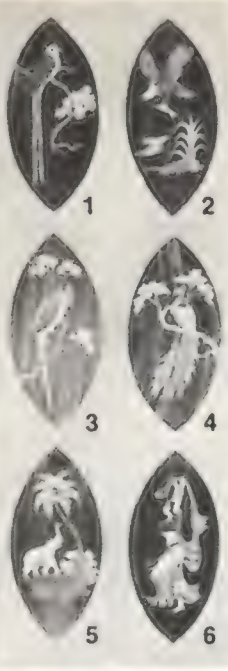

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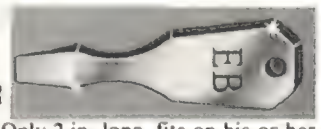

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Smithsonian highlights

Puppet show at Cooper-Hewitt includes Harry Burnett's *Ice Skaters*, 1951.

Holiday season means celebrations. Every afternoon, December 26-31, the halls of the Museum of American History will ring with bells, Christmas carols, Jewish songfests, gospel and madrigals; activities will include paper cutting, the making of menorahs, making calendars on a 19th-century printing press, daily films at 10:30 A.M., and portrayals of scenes from *A Christmas Carol* and *Pickwick Papers* at 1:30 and 3:30 P.M. For detailed information, call 357-2700. Other museums offering special holiday fare are the Hirshhorn and Museum of African Art (see below).

Special December events

National Museum of American History
Holiday Celebration (December 26-31) Music, activities and demonstrations.
Trees of Christmas (December 21-January 3) Decorated trees reflect heritages.
19th-Century Drawing Devices and their Products (through November 1982) Machines that carried out draftsmanship.
General von Steuben: A Secret Weapon for the Americans (opens December 12) Collection commemorates 250th birthday of this hero of the Revolution.
Lighting Up America: From Candle to Kerosene New exhibit on light.

Museum of African Art
Life . . . Afterlife: African Funerary Sculpture (through March 1) Sculpture, maps, diagrams, textiles and utilitarian objects.
Concert (December 26, 8 P.M., Baird Auditorium, Museum of Natural History) African music celebrates the harvest and New Year festival, *Kwanza*.
Crafts and Stories (December 28-31; 11 A.M. and 2 P.M.) Call 287-3490 for reservations for holiday activities.

Renwick Gallery
Good as Gold (December 3-March 28) Jewelry and alternative materials (p. 204).

Cooper-Hewitt (New York)
Puppets: Art and Entertainment (December 15-Feburary 21) More than 100 puppets (above) illustrate trends.
In Small Stages (December 1-March 7) Antique and 20th-century puppets from the museum's collection.
Suburbs (through January 24) Historical survey, from prototypes to the future.

Freer Gallery of Art
Autumn's Voices (through December 31) The season's motifs in Japanese art.
The Imperial Image—Paintings for the Mughal Court (through January 28).

Hirshhorn Museum & Sculpture Garden
Hirshhorn Holiday: A Celebration for Children (December 5, 10 A.M.-2 P.M.) A variety of activities.
Metaphor: New Projects by Contemporary Sculptors (December 17-February 28) Large-scale works.

National Museum of Natural History
Dinosaurs and Other Reptiles New exhibit related to fossils and evolution (pp. 99-114); lecture by curator Nicholas Hotton, December 11, noon.
Botanical Prints by Henry Evans (December 12-February 7).
Hopi Kachina: Spirit of Life (through January 3) Slide show, pueblos, figures.

National Portrait Gallery
Portrait Prints: The 20th-Century Approach (December 11-July 18).

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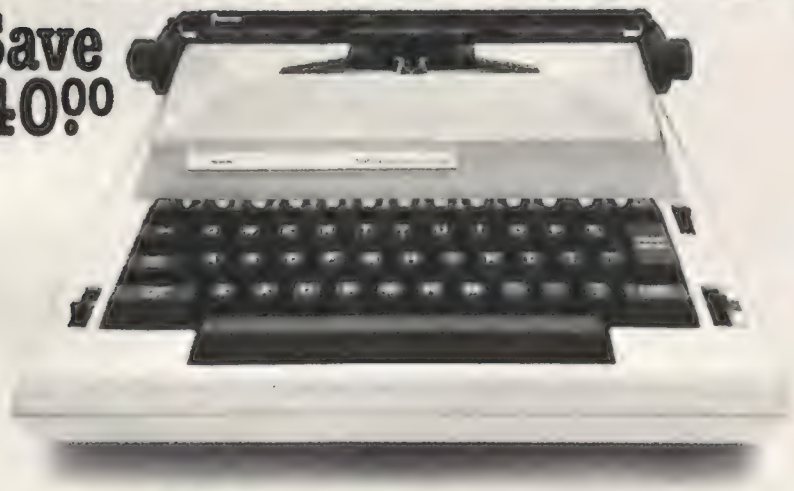

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National Air and Space Museum
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Was There a Christmas Star? (December 5, 9 A.M.) Monthly sky lecture.
Astronomy Series (December 28, 29, 30) Daily lectures at noon.
Feature Films (December 3, 17; 7:30 P.M.)
Concerts (December 3-18; afternoons).

Smithsonian events
For tickets and price information on Resident Associate events, call 357-3030:
The Dinosaur Epoch (December 12) An all-day seminar.
Saturn: A New Look (December 7, 8 P.M.)
Alma Thomas and Afro-American Art (December 8, 8 P.M.) Illustrated lecture.

For information and tickets to Division of Performing Arts events, call 357-1500:
Dance and the Camera (December 7, 8 P.M.) Evening with Merce Cunningham.
20th Century Consort and the American Boychoir (December 21, 8 P.M.) Concert.

Smithsonian Institution Traveling Exhibition Service
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Hollywood, Florida (December 16-March 7) *Western Views and Eastern Visions,* Art and Culture Center.
Miami (December 5-January 3) *Artists and Space Flight,* Miami Space Transit Planetarium.
Grand Forks, North Dakota (November 28-December 27) *The Contemporary American Potter,* University of North Dakota.
Altoona, Pennsylvania (December 19-January 17) *American Drawings III,* Southern Alleghenies Museum of Art.
Memphis (December 12-January 10) *Know What You See,* Dixon Gallery.

Membership Benefits
Most Smithsonian museums are open daily from 10 A.M. to 5:30 P.M. (On Christmas Day, all museums and the zoo are closed.) The warm welcome for members at the Associates Reception Desk in the castle, 10 A.M. to 4 P.M. daily, includes printed materials and details about all benefits—relaxing in the Lounge, dining in The Court, discounts in museum shops and the slide/lecture orientation on the 13 Smithsonian museums.

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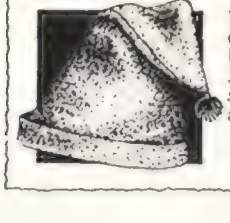

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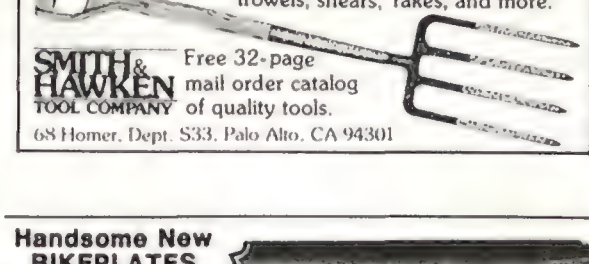

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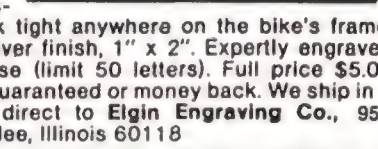

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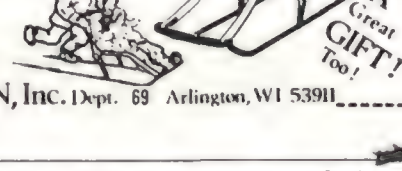

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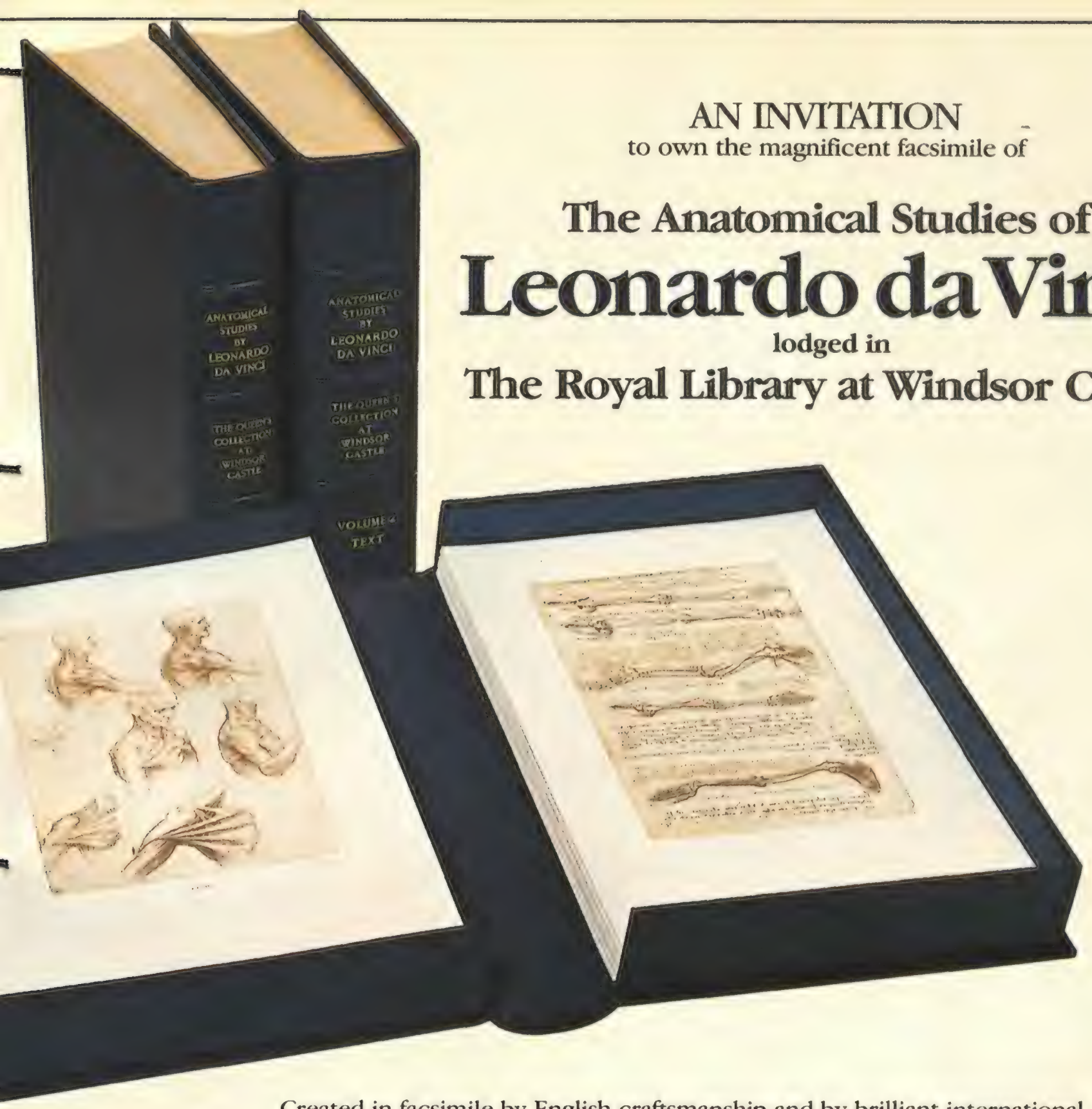
(signed) Carey O. Rand[illegible]
General Manager



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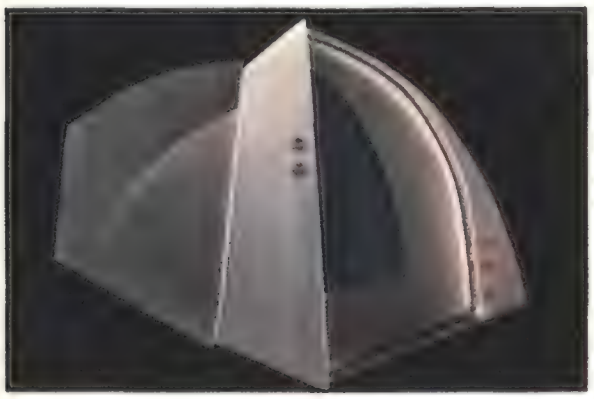
Modern jewelry shows its stuff

A blend of old techniques and new materials results in some pretty precious work, at the Renwick

They call it "wearable art," which means you can find it on a person or in a museum. In this case, it's the latter, in a new exhibit entitled "Good as Gold: Alternative Materials in American Jewelry," at the Renwick through March 28. The show, on a two-year tour organized by the Smithsonian Institution Traveling Exhibition Service (SITES), illustrates that fine workmanship and artistry can bestow its own kind of intrinsic value.

In the catalog, curator Lloyd Herman refers to gold, silver and precious stones and asks: "If the ancient material still preferred for jewelry has become too expensive for contemporary jewelers, what can replace it?" The answer comes with the stunning entries and their descriptions: cast-off watch faces, doll parts, smashed cans, a clinical thermometer, washers, staples and plastic tubing. Along with such metals as brass, copper and aluminum, the artists have used space-age creations, titanium, niobium and tantalum, that glow when electric current or heat is applied. They also turned to traditional techniques—engraving, enamel, ceramics, scrimshaw, crochet. The results are equally varied, from glowing purple earrings and a woven metal necklace to a simple ceramic pin of bacon and eggs.
Carol Simons



Aluminum pin by David Tisdale is among works in alternative metals.

Bob Natalini used tropical beetle, cast polyester and working electronics.

Pin by Martha Glowacki is of bronze, sterling silver, copper and epoxy.

Julia Shaw's *Oz-East?* uses vinyl, photos, cardboard, felt, lucite, aluminum.

Yes, Alan Burton Thompson's pin is made from slide mount and steel snaps.

Neckpiece by Susan Kingsley and Judith Ubick links bottle and jasper beads.

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As a Smithsonian Associate, you can enjoy the benefit of culturally oriented experiences under the guidance of museum curators or visiting scholars. Your lively curiosity and broad interests have resulted in a comprehensive study program to meet many tastes and budgets.

Domestic Study Tours

Christmas at the Smithsonian December 4-6: Behind-the-scenes tours, including the new dinosaur exhibit at Natural History Museum (p. 99), dinner in the castle and a National Children's Choir concert.

South Texas Wildlife February 18-25: Follow winter bird migration to the Gulf of Mexico and Rio Grande Valley; visit wildlife refuges of Aransas, Padre Island, Laguna Atascosa and Santa Ana.

Yellowstone in Snow February 19-28: Cross-country skiing in Jackson, Wyoming, and Yellowstone National Park to discover the splendors of nature.

Everglades March 6-13: Explore a subtropical wilderness best known for its abundance and variety of birdlife and home to deer, otter, and alligator. Activities include canoe trips and visit to Corkscrew Swamp Sanctuary.

Washington, D.C.: Power and Style March 30-April 4: Discover the fascinating events that shaped our nation's capital. Spend a day in Congress; visit charming neighborhoods and historic memorials during cherry-blossom season.

Savannah/Charleston April 12-19: Experience the gracious living of the past with visits to historic homes and plantations.

Sea of Cortez April 23-May 1: Adventure cruise off Baja Mexico exploring the rich variety of plants and migratory seabirds on the Midriff Islands, and observing finback whales, porpoises and dolphins.

Asheville May 20-24: Visit Biltmore and other historic homes in this mountain resort area. Also visit World's Fair in Knoxville.

Washington "Anytime" Weekend: Brighten your winter with an economical weekend visit to your choice of Smithsonian museums. Come any weekend for two or more nights at Loew's L'Enfant Plaza or Hyatt Regency Washington. Package includes hotel, meals, sightseeing and exclusive tour of Smithsonian castle. Reservation and payment at least ten days prior to arrival.

Foreign Study Tours

These tours range in size from small group experiences to charter adventures and vary in price from low cost to deluxe, depending on the type of travel, destination visited and length of trip:

People's Republic of China 1982: New exclusive programs for travel with a Sinologist to learn about the art, ancient treasures, temples and bustling cities of this complex culture.

Baroque Winter: Vienna, Salzburg, Munich January 3-17: The splendors of Central Europe with walking tours, museum lectures, opera and concerts. A special Smithsonian Viennese Ball is included.

Panama and the Spanish Main January 9-16: Experience the thrill of traveling from the Pacific to the Atlantic through the Panama Canal. Continue to the fascinating San Blas islands, then the Spanish Main bastion of Cartagena. Our chartered ship *Jason* also calls at Bonaire in the Dutch Antilles, Barbados and Margarita—the pearl island.

Mayan Mexico: The Yucatán Peninsula January 21-February 2 or February 10-22: The extraordinary ruins of the Yucatán in the company of an archaeologist—Uxmal, Palenque, Labná, Sayil, Kohunlich, Cobá, Tulum and Chichén Itzá.

Kenya January 28-February 14: Incomparable wildlife is observed in old safari tradition. Seminars and in-field lectures focus on nature and African culture.

Tall Ship Adventure February 12-21: Set sail on the luxurious 317-foot, four-masted sailing yacht *Sea Cloud* from Antigua to the Grenadines. Lectures and excursions enhance this fabulous sailing experience in the Caribbean.

Zapotec and Mayan Mexico February 24-March 8 or March 17-29: Oaxaca and Zapotec sites of Monte Albán and Mitla; San Cristóbal de las Casas; Palenque, Uxmal and other Mayan ruins in the Yucatán.

Red Sea Passage February 25-March 7: Sail from Suez on the *Argonaut*, visit Karnak, Luxor, Valley of the Kings, Abu Simbel in Egypt and Petra in Jordan. Tour the mosques and bazaars of Cairo, the Sphinx and pyramids at Giza. Optional Jerusalem prelude—February 18-26.

Morocco March 5-20: Exotic Fez, Marrakesh and Rabat, colorful and tempting markets in ancient medinas, the powerful and lonely beauty of desert and mountain provide an exciting learning experience.

Australia March 19-April 6: Discover the diversity of "Down Under." Visit Sydney, Melbourne, the Barrier Reef, Alice Springs and Ayres Rock.

Ecuador and the Galápagos Islands April 4-15: Visit Quito, then travel by train to Guayaquil to board the *Buccaneer* for a seven-day voyage. Study the rich plant, bird and animal life; meet scientists at the Charles Darwin Research Station.

Canals and Old Masters April 16-28: Art museums, historic sites, and spring flowers highlight visits to Brussels, Antwerp and Ghent. From Bruges, sail on rivers of Belgium and Holland, ending with four colorful days in Amsterdam.

Crete and Rhodes May 3-17: Complex Minoan palaces, Byzantine frescoes, the medieval walled city of Rhodes, and the superb acropolis of Lindos are surrounded by the sparkling beauty of these Aegean islands.

London May 9-23: A full program of special lectures, walking tours, theater, excursions and a five-day travel seminar into the English countryside.

History and Romance of the Rhine—from the Alps to the Sea May 17-June 1: Following a program in Zurich and Basel, embark on our chartered ship for a seven-day study voyage to the great castles and cathedrals on the Rhine. Guest lecturers will interpret the splendors of Strassburg, Heidelberg, Cologne and Amsterdam.

Yugoslavia May 21-June 5: From Dubrovnik, the remote southeastern region affords a rare opportunity to visit a rich variety of landscapes and monuments.

Alpine Countryside May 29-June 13 or September 11-26: Study folk culture, architecture, music, history and geology in a charming Austrian mountain village.

Cotswold Countryside June 27-July 11 or July 11-25: Stay in Cirencester, in the midst of England's ancient green hills. Visit archaeological sites, market towns, woolen mills, museums and private homes. Travel to Oxford, Stratford, Bath.

Write National Associates, A&I 1278 Smithsonian Institution, Washington, D.C. 20560 or call (202) 357-2477 for specific tour brochures

in Washington

Selected Studies Seminars

Enjoy the treasures of the Smithsonian in popular programs which combine excellent speakers and special behind-the-scenes tours. Choose from:

Post-Impressionist Masters March 7-12: Bill Kloss explores the outstanding paintings of artists such as Gauguin, van Gogh and Cézanne in lavishly illustrated lectures and tours of great museums.

Genealogical Research March 14-19 or March 21-26: Taught by Milton Rubincam, Marilyn Duncan and other leading authorities, participants learn how to conduct research in major genealogical repositories such as the National Archives, Library of Congress and DAR Library.

Religions of the Far East March 28-April 2: The great traditions and practices of Buddhism, Confucianism, Taoism, Shinto and Zen, which have inspired and motivated the greatest minds of Asia for more than 2,000 years.

American Painting in the 19th Century March 28-April 2: The great artistic achievements of renowned masters such as Copley, Cole, Church, Homer, Ryder and Eakins. Includes tours of the Capitol and National Gallery of Art.

Chinese Ceramics April 18-23: Connoisseurship of the timeless beauty and outstanding craftsmanship of famous masterpieces. Highlights exquisite export wares, enameled porcelains, recent discoveries, dating controversies, detection of fakes and the market today.

Quilting: Traditional to Modern April 25-30: Talented author and designer Jinny Beyer shares secrets of success in drafting, fabric and color coordination in lecture/workshops and tours of the outstanding collections of the Smithsonian and DAR.

In Tucson, Arizona:
The New Astronomies May 9-14: Springtime in Arizona at two of the most advanced scientific research facilities in the world, the Fred Lawrence Whipple Observatory (formerly Mt. Hopkins) and Kitt Peak National Observatory, with lectures and tours by their directors and eminent staffs.

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or (202) 357-2475 for seminar brochures.

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By Robert Wallace

Towering idea goes wrong —and Paris is stuck

Paris, 1 June, 1886

Dear Cousin Hélène:

Great news: I have won the competition! The Minister of Culture, known as M. Grippe-Sou, has accepted my design for the central buildings of the Grand Exposition to be held three years hence. I envision two identical structures of astonishing loftiness side by side near the bank of the Seine, buildings of such unprecedented scale that I have given them the rather poetic name *gratte-ciels,* or "skyscrapers."

In shape they will be elongated rectangular boxes, standing on end, towering 300 meters—or as you in America would put it, more than 1,000 feet—above the city. You may cry, "Impossible!" but I assure you there have been architectural advances that render the feat practical. The framework of the buildings will be of newly developed structural steel, and the exterior of a lightweight, silver-hued metal. *Eblouissant!*

It is perhaps too much to hope that Minister Grippe-Sou will honor me by calling the pair of towers by my name. Indeed, as they are to be the centerpiece of a great commercial fair, I believe he has in mind to call them the World Trade Center.

However, that is a small matter compared to another development. Although I have to raise most of the money for the towers myself, M. Grippe-Sou has already begun to speak of certain necessary economies. I am beginning to understand why he has that name, Grippe-Sou; he is a difficult man with a franc.

Your skeptical cousin,
Gustave

Paris, 15 January, 1887

Dear Cousin Hélène:

How fortunate you are to be in America far from the scene of these incessant and degrading discussions! M. Grippe-Sou is a small-eyed man of the most bourgeois instincts but he has, unfortunately, the whip hand. During many months of tedious niggling, he has attacked my twin towers with his budgetary knife, slicing off here a meter, there a meter, until at his last proposal both towers would have been only half their originally contemplated height. That was intolerable. I counterproposed that we have a single tall tower and he has grudgingly agreed to this compromise.

So we shall have one, not two. And instead of building the tower of steel, I am forced to use wrought iron (yes, wrought iron, that vulgar material).

Despite the loss of 50 percent of my grand design, I console myself with the thought that this soaring silver box, fit to hold long-stemmed roses for the gods, will be the greatest architectural achievement of our age. Next week we are to begin excavation for the foundations.

Your philosophical cousin,
Gustave

Paris, 22 March, 1888

Dear Cousin Hélène:

You will scarcely believe the problems that have been created by the Minister, M. Grippe-Sou, who has revealed himself as an undoubted species of pig. When the framework of my building had been erected only to the level of the third floor, Grippe-Sou announced that there were not sufficient funds to carry out my plan as originally set forth. I have been faced with the necessity of making the fourth floor slightly smaller in area than the third, and the fifth slightly smaller than the fourth. God knows where this will lead if these insane depredations continue.

Grippe-Sou is also raising objections, yet again on the grounds of economy, to my proposal to sheathe the exterior of the building in a silver-hued metal. I can imagine what he probably will suggest next: glazed chintz.

Your disconsolate cousin,
Gustave

Paris, 31 March,1889

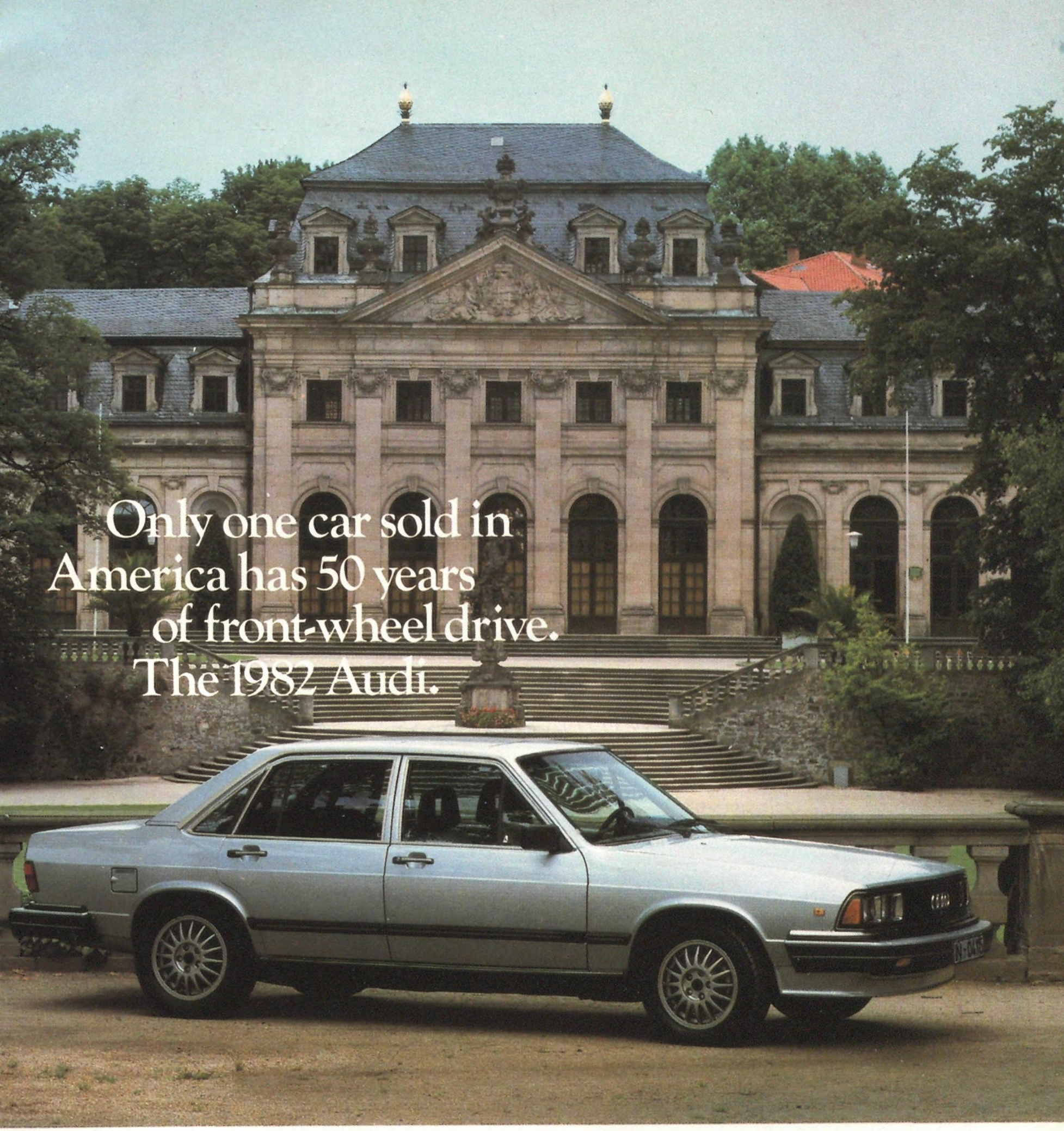
Dear Cousin Hélène:

This day the framework of what was to have been my masterpiece, and is now my humiliation, has been completed. Hounded at every turn by that execrable Grippe-Sou, I have been forced to make the floors of constantly increasing smallness until at the topmost level there is barely enough room for a midget to play a piccolo.

Grippe-Sou will not give me the money to sheathe the building or even to put the flooring in place. Thus the great structure is of use only as a roosting place for bats and owls, and of so deplorable an appearance that the people of Paris refer to it as "the junkman's Notre Dame."

To make my ignominy complete, M. Grippe-Sou informs me that this grotesque tower will not be known as the World Trade Center but will be named in honor—*quelle ironie!*—of

Your disgraced cousin,
Gustave Eiffel



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